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Distance Music

From Early Telephony to Tomorrow's Internet

Fokko Schulz

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in Media Studies, The University of Auckland, 2013.

Abstract

Teleconferencing, teleworking, telepresence, skyping and distance education have transformed the ways we relate to the world. This music-in-media study explores the conditions that gave rise to the related Internet phenomenon of what I will refer to and discuss as *distance music*. Distance music is a subject of interest to music-in-media studies, sound studies, popular music studies, new musicology and technology studies. Contrary to those who find the origins of distance music in the creative use of computers and electronic networks in the mid-20th century, this study instead locates its origins in the much-neglected media development of early telephony. Driven by technocultural transformations, the key to the rise of today's open and democratic music culture on the Internet lies in this emergent culture of telephony in the late 19th century. Based on theoretical, historical, and empirical research, I argue that early telephony formed the basis of present-day music through the media. It heralded our modern uptake of music. This argument critically discusses historian Jonathan Sterne's ideas on telephone music, and what he calls "Ensoniment" or the sonic equivalent of Enlightenment. First, this study provides a conceptual framework of different ideas on the subject of transformation in music and technology, emphasising the social and cultural origins of sound technologies. Concerning media theory, I stress that—unlike with the radio and phonograph—a sound medium that largely involved human self-determination and participation already existed with early telephony, and that is similar to what we observe on the Internet today. It then, from a historical perspective, traces the marginalised development of early telephone music between 1870 and 1900, revealing not only a female-dominated sound medium, but also how music transmission actually began several decades earlier than commonly perceived with radio. Finally, interviews with leading manufacturers of digital music technologies, show that there is a digital divide in today's world of music-making on the Internet, even though the technological possibilities for it have existed since before the turn of the 20th century. This study thus collectively offers a critical and wide-ranging account of a music-in-media phenomenon that gave rise to a new, distinctive regime of sound on electronic networks today, differing from the old industrial model of music. It discusses the historical and theoretical implications of a shift in contemporary music culture from a largely authoritarian, heteronomous (other-directed, externally controlled) regime of sound, to a situation where the artists rather autonomously gain control and authority in the formation of a larger, distributed sphere of music production and consumption.

Acknowledgments

The reason why I decided to work on the subject of distance music reflects my personal interest in music. As a leisure drummer, my curiosity in the subject reaches back to my student life at the Philipps-University of Marburg, Germany, where I used to play drums in a singer-songwriter band (though my passion is for experimental music). After the band members got their college degrees, they moved away to different towns, as is usually the case. But we wanted to continue the band and therefore started thinking about different ways of playing music together at a distance from where each one of us lived: Marburg, Hamburg, and Berlin. Eventually, we decided to meet face-to-face in Berlin to play and work on new songs about every other month. This unique experience is what got me originally involved in exploring the appeal and problems in the subject of distance music.

As with most research studies, this music-in-media study also evolved over several years, between 2008 and 2012. Several key people and institutions need to be thanked at this point for their support in the development and completion of this study. First, I would like to thank my teachers at different universities in three countries where I worked on this project. My greatest gratitude and appreciation are to my main PhD supervisor, Nabeel Zuberi, at the Department of Film, Television and

Media Studies at the University of Auckland in New Zealand. Nabeel skilfully and patiently guided me through the academic jungle. He showed me the right way to bring this project into being—from the earliest brainstormed chapter drafts to the thesis in its present form. I would also like to thank my associate supervisor Luke Goode for his helpful comments on my chapters, steering my English writing skills to the next level at just the right time. Nabeel's and Luke's supervision of my PhD project were crucial. My acknowledgements also go to Duncan Petrie, Misha Kavka, and Adam White, who all supported my work at the Department of Film, Television and Media Studies at the University of Auckland.

In Germany, my main gratitude goes to Knut Hickethier at the Institute of Media and Communication at the University of Hamburg. He had previously supervised my Master's thesis on "Virtual Music," as well as the early stages in the PhD proposal before I moved to study overseas. Hickethier gave me the opportunity to present parts of my research at a media studies workshop in Hamburg called "Radio Research/Audio Research" (Radioforschung/Audioforschung), which started to create an audio counterpoint to the then-dominant visual media that was prevalent in German media studies. Hickethier encouraged me to do my PhD, and in this way, he contributed to my entry into the research world. I am grateful for that opportunity. I would also like to thank Rolf Schulmeister and Joan K. Bleicher at the University of Hamburg. Their letters of reference helped me to learn and gain experience overseas.

In the United States, I express my thanks to Margaret Morse at the University of California in Santa Cruz (UCSC). She was my main supervisor and contact person during my time as a visiting student at the Digital Arts and New Media Program at UCSC. UCSC served as my home institution during the empirical research phase of my PhD. It mainly involved organising, conducting, and evaluating interviews with musicians and manufacturers of music technology. As a foreign exchange student in the United States years earlier, I had already experienced much hospitality and warmth from the people around me. Having just come from Germany, I found their actual mindset and massive amounts of proactive energy most striking. Their positive attitudes were accommodating and helpful—especially to someone who had just migrated overseas and was transitioning to a foreign country. Living in Santa Cruz and attending UCSC were important and inspiring experiences for both the progress of my empirical research and advancing my English-language skills further. On a personal note, I had the pleasure of being involved in sports, music, and socialising (before facing the rather monastic situation of writing up the PhD project). My thanks go to Nada, Matt, Pete, Cynthia, Micha, Alex, and Bill, as well as many other people in Santa Cruz who made my stay a very memorable and inspiring experience.

Aside from the benefactors of my study at the Universities of Hamburg, Auckland, and California, I would also like to thank other key academic institutions. During the different phases of my PhD, I acquired enough funding to support this project. Initially, the German Academic Exchange Service (DAAD) made it possible for me to conduct interviews overseas and see the Digital Arts and New Media Program at the University of California in Santa Cruz. In the United States, the National Communication Association (NCA) provided me with a small grant, allowing me to present the first results of my empirical research at the conference "Exploring New Media Worlds: Changing Technologies, Industries, Cultures, and Audiences in Global and Historical Context" at Texas A&M University in 2008.

Probably the single most influential institution in the development of my PhD was Education New Zealand. The organisation granted me a New Zealand International Doctoral Research Scholarship (NZIDRS) to come to New Zealand and bring the project to paper between 2008 and 2012. I am truly grateful for this exciting experience in Aotearoa/New Zealand. Besides an additional NZIDRS as well as a University of Auckland Scholarship and other smaller research funds enabling me to finish the thesis, I also acquired some travel allowances at different times during my PhD, which allowed me to participate in international research events. One was a critical media studies workshop led by Geert Lovink at the University of Melbourne, Australia in 2009. I was also fortunate to get some support from the Association for Cultural Studies (ACS), which made it possible for me to present a paper at the International Crossroads Conference at the University of the West Indies in Kingston, Jamaica in 2008. In short, the institutional support allowed me to meet and share ideas with researchers from around the world and gain truly essential intercultural experiences. The experiences I had could not come from studying books, and without generous institutional support, various research projects and intercultural exchanges like those I was privileged to experience would have soon come to a halt.

Meeting and discussing with other international PhD students and media researchers inspired parts of this thesis. For instance, my enthusiasm for the historical fourth chapter entitled "The Conundrum of Telephone Music" draws partly on discussions at the previously mentioned Hamburg workshop "Radio Research/Audio Research" with its rich historical focus on sound reproduction technologies in the late 19th century. Chapter 5, entitled "Jamming at the Speed of Light on the Internet?" is another example of my personal interactions with other researchers. Economist Helge Kaul at the Zurich University of Applied Sciences in Switzerland (whom I met through music making) put me in touch with economist and musician Jörg Beckmann, former marketing manager of the companies Steinberg Media Technologies in Hamburg, and Native Instruments in Berlin. With Beckmann, I coauthored a German-language book chapter on "Online Music Communities."[1] Beckman also provided me with a necessary invitational pass to gain access to the publicly closed National Association of Music Merchants (NAMM) Show in Anaheim, California, where all leading manufacturers of music technology exhibited their new products. These contacts helped me to interview some of the most prominent and influential manufacturers of music technology today—the basis of empirical Chapter 5.

Writing a PhD in another language represents an often-underestimated challenge. I was fortunate to write it under the direction of native English speakers—my two British supervisors Nabeel and Luke. People who studied abroad can probably understand the trouble or struggle to aptly express thoughts on paper in a language different to one's own native language. Examples of such English writing challenges arise with words as clear as "perhaps," "possibly," "probably," and "maybe." It is not just about rationally knowing the difference among these adverbs, but rather to cultivate a feel for the subtleties of their use in the language. Given these English writing challenges as a non-native speaker, I would like to thank Arista Chand, who helped me in proofreading each chapter before my supervisors evaluated them. In the early stages of my work, Cynthia Payne helped shape my first English paper attempts (sometimes one has to jump into the cold water). Special thanks also go to David Bolsover's linguistic expert eyes and his detailed comments on the final version of this project before its submission to the University of Auckland.

I would also like to thank the band members of the Keaton Collective, especially its guitar player and singer Alex Jones, with whom I happened to share an apartment with in Santa Cruz. We had many conversations and inspiring sessions. Like my former singer-songwriter band, Keaton was in a similar situation with its band members living distributed all along the American West Coast from southern

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[1] Jörg Beckmann and Fokko Schulz (2008) "Online Music Communities und Kooperationsstrategien bei Steinberg Media Technologies GmbH/Yamaha Corp. Japan" (135-54), in *Community Marketing: Wie Unternehmen in sozialen Netzwerken Werte schaffen*, eds. Helge Kaul and Cary Steinmann, Schäffer-Poeschel Verlag, Stuttgart, Germany.

California up to northern Washington. Eventually, Keaton's band members decided to move together north to a college town called Bellingham near the Canadian border.

On a closely related note to music-making and academic writing, I would like to thank Venerable Tenzin Chosang for his impressive 2012 introductory class to meditation at the International Buddhist Meditation Temple of New Zealand in Parau. Meditation was powerful and valuable; even practicing it moderately reduced some stress and positively affected my ability to concentrate for longer periods. It was especially useful for writing and drumming practices. Thanks also to Insook and Bokyung Sunim for their help and motivational teatimes up in the mountains.

Finally, and most importantly, I would like to thank my family. Mom, Dad, Dieter, Carol and David always supported and encouraged me with good conversations and care packages throughout the research process. Thanks also to Francesca who for some time put up with the different tides and moods, ups and downs, that came with undertaking this research project. At low tides, it always helped to realise, "this text is my construction site; it lays fallow unless I put my thoughts and hands on it."

Laingholm, New Zealand, 2013

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1. Introduction: How the Present Recalls the Past

> Thy magic reunites those
> Whom stern custom has parted;
> All men will become brothers
> Under thy gentle wing.
>
> Verse of Beethoven's "Ode to Joy" (1824)[2]

February 7, 1998. Japan's *Kyodo News* reported that during the spectacular opening ceremony of the Olympic Winter Games in Nagano, conductor Seiji Ozawa directed the final choral movement, "Ode to Joy," from Ludwig van Beethoven's Ninth Symphony—a setting to music of Friedrich Schiller's poetry on the unity of humanity—live on five continents and six cities at the same time: in Nagano, Sydney, New York, Beijing, Berlin and False Bay, South Africa. In each of these cities, 200 choral singers sang across vast distances by satellite and Internet along with 2,000 singers at the Olympic Stadium and eight vocalists and an orchestra at the Hokuto Culture Hall elsewhere in Nagano. Also, an audience of about 50,000 people followed this remarkable reproduction of "Ode to Joy" on large video screens in the Olympic stadium, while yet others viewed it from overseas as a television broadcast—including ceremonies like the sounding of an old gong at the Zenkoji Buddhist Temple in Nagano—transmitted to 160 countries at once.[3]

Eighty-six years earlier in 1912—or 88 years after Beethoven finished his version of "Ode to Joy" in 1824—about 700 news publishers gathered at the grand Waldorf Astoria Hotel on Fifth Avenue in New York City. They met for a joint meeting of the Associated Press and the American Newspaper Publishers' Association. As cultural historian Carolyn Marvin recalls in her book *When Old Technologies Were New* (1988), all these "newspapermen were treated to a special after-dinner telephone program" (212-3). Each news publisher "listened on a special receiver fitted into a watchcase" to the voices of President Taft from Boston, and Canadian premier Robert Borden from Hot Springs, Virginia. Another performer recited a Rudyard Kipling poem over the telephone, transmitted from Daly's Theatre on 1221

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[2] Also known as "Ode to Freedom." Beethoven cited in John Tresch (2012: 73) *The Romantic Machine: Utopian Science and Technology After Napoleon*, The University of Chicago Press, Chicago.

[3] Kyodo News in Shinano Mainichi Newspaper (1998) "Nagano Olympics Opening as Largest Winter Games Ever," available at http://www.shinmai.co.jp/oly-eng/199802/0001.htm (April 2012).

Broadway Avenue, New York City. The audience of news publishers could follow a distant vocalist singing into the telephone a "Southern Song" from the Winter Garden Theatre on 1634 Broadway in midtown Manhattan.

What is striking about the above Olympic and Waldorf events is how they contrast to the standard way of thinking about music transmission today. When people think about music transmission, probably the first thing that comes to their minds is that musical groups on radio or television can be heard a long ways away. Nothing is wrong with that thinking, but it has a shortcoming. It implies that musicians always gather at the same physical location such as one stadium or hotel to play music. However, the listeners have long been accustomed to hearing live music in a location different from where the performers are, as live, reproduced music on radio or television. Thus, what is significant about the Olympic and Waldorf event is that some of its performers played distributedly—physically separated from one another—across large geographical distances. By 1912, listeners, by contrast, had already had much experience in listening to a reproduced or transmitted musical performance from a distance, away from the musicians. In other words, the standard way of thinking about media of sound reproduction tends to regard the situation of distant audiences, while neglecting that of distant performers.

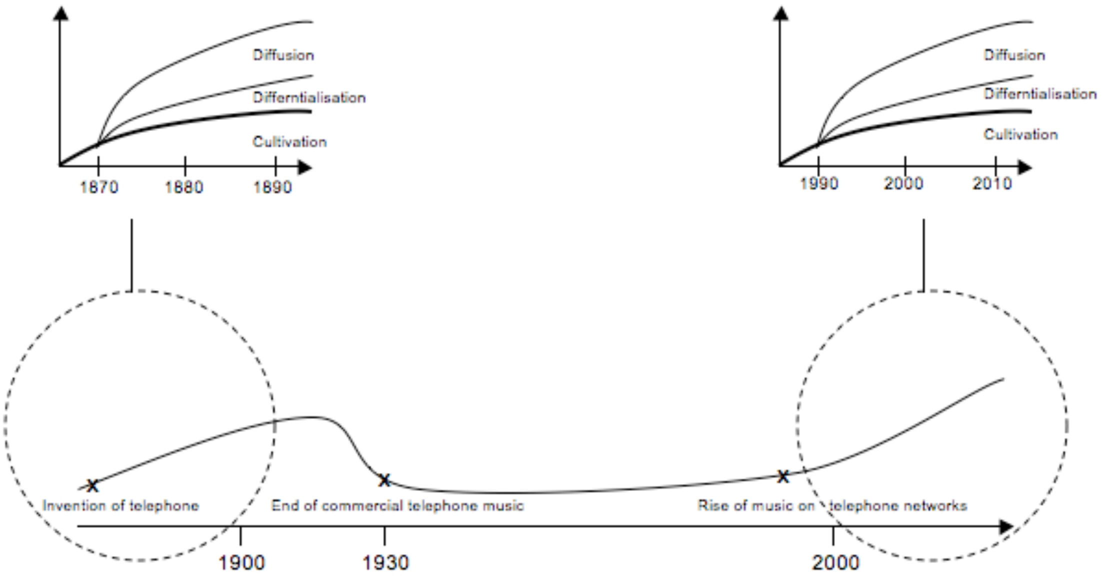
What does the term "distance music" mean? It is an umbrella notion comprising spatiotemporal, historical, technological, and theoretical aspects of sound relative to distance. The common meaning of "distance" involves a logical or numerical interpretation of spatial distance between two or more entities—between performers, audiences, Japan and South Africa, Virginia and New York. American psychologist and philosopher William James used the term "distance" in 1890 saying, "recently M. Liégeois has hypnotized some of his subjects at a distance of 1 ½ kilometres by giving them an intimation to that effect through a telephone" (595). Besides spatial distance, we can also find other useful connotations of distance in James' statement. One connotation involves distance technology, because James named the medium of the telephone. If James had said this today, he might have replaced the telephone with the Internet, and highlighted instead how Liégeois hypnotised his subjects at a distance of, say, 10,000 kilometres. I am not downplaying the significance of media and spatial distance. On the contrary, the overcoming of spatial distance through technologies of distance media, especially the telephone and the Internet, can be easily overlooked and taken for granted. We will see that the overcoming of spatial distance in music making, which matters greatly in music listening, is still in its infancy today.

Another meaning of “distance music” involves the distancing effects occurring when we experience music remote in space and time. Computer network musician Chris Brown (2005) of The Hub hints at these effects when he says that music from afar “involves a distancing of the physical connection between sound and individual body” (373). The notion of distance music considers such distancing effects in music as explained by media theorists later in this work. Besides theoretical, technological, and spatial aspects of distance music, James’ above statement on early telephony leads us to think as well about the temporal meaning of distance music. By temporal, I first of all mean the historical distance from early developments of music on electronic networks in the sense of how today’s music has travelled in time and over electronic networks from the late-19th to the early-21st century. Distance music is an old media phenomenon, disguised today in new media garments. Looking into its past allows us to shed light on the present of music by computers and on the Internet. But historical distance relative to the present also involves utopian distance, such as 1800s science-fiction visions on how music might sound today and, in turn, today’s visions of tomorrow’s music culture. Put differently, the idea of distance music bears on a shared momentum between past, present, and tomorrow’s developments of music on electronic networks. Central to this study is the tracing of the early predecessors that gave birth to the phenomenon of distance music. Tracing its origins informs and contextualises a new, distinctive regime of sound today.

“Distance Music—From early Telephony to Tomorrow’s Internet” embraces a development from then to now and the future. But it is meant less in a chronological sense of neatly listing the development of sound technologies along a timeline and investigating transformations in music culture step-by-step forward through history until the present time. What this project pursues instead is a rather comparative purpose of network music as produced through early telephony versus the Internet age. To follow this purpose, the thesis combines ideas of two different theories of media diffusion in one diffusion model, demonstrated in Figure 1 below. The first theory is Austrian sociologist of music Kurt Blaukopf (1989) and Alfred Smudits’ (2002) theory of mediamorphoses in music. Mediamorphoses in music investigate large-scale historical transformations looking at long-periods or cycles of transformations in music culture and technology, such as the effects of printing technology on music culture around the 15th century, and electricity in the 19th century onwards (see chapter 2 “Transformations in Music Culture and Technology”). I use the theory of mediamorphoses to examine connections between the innovation of electricity in music over telephone networks in the late-19th century and the innovation of digitality in music in the late 20th century (see the two encircled endpoints or ‘boom phases’ of music on telephone networks in the media diffusion model below).

The other applied theory is German social scientist Herbert Kubicek and Ulrich Schmid’s model of media diffusion proposed in their essay “Everyday Life Information Systems as Media Innovation” (1996), detailed in the introduction to chapter 4 “The Conundrum of Telephone Music.” Compared to Blaukopf and Smudits’ theory, Kubicek and Schmid’s theory looks at a much smaller technocultural scenario and timeframe that uses three ideal-typical phases of media diffusion: a new medium’s phase of “cultivation,” followed by its phase of “differentiation and formalisation,” and eventually its phase of “infrastructural diffusion.”

I used these three phases of media diffusion to investigate, first, the early development of distance music regarding the “Cultivation of Musical Telegraphy,” then the “Differentiation of Telephone Music,” and the “Diffusion of Telephone Music” in the late-19th century. By extension, in chapter 5 “Jamming at the Speed of Light on the Internet?” the idea of Kubicek and Schmid’s theory of media diffusion reappears in the three studies on the “Virtualisation of the Musical,” “Collaborating at a Distance,” and “Glitches of Distance Music” that take into account the late-20th and early-21st century.


Diffusion
Differntialisation
Cultivation
1870
1880
1890
Diffusion
Differntialisation
Cultivation
1990
2000
2010
Invention of telephone
End of commercial telephone music
Rise of music on telephone networks
1900
1930
2000

[Fig. 1] Media diffusion model of music on telephone networks from the late-19th century to the early-21st century. Focus is on the two encircled endpoints or boom phases of the phenomenon regarded in the case studies "The Conundrum of Telephone Music" and "Jamming at the Speed of Light on the Internet?"[4]

Objections against the above-proposed model of media diffusion might be that it promotes a historical gap or jump between the two endpoints at stake. That is true to a certain degree. However, the difference is that the model does not promote an unintentional gap but a consciously intended gap as a methodological device to explore the division between music on early telephony and music in the present Internet age. It is important to realise that this study focuses mainly on two-way transmission media, which historically, were first introduced with the innovation of electricity and sound transduction in telegraphy and telephony. Then, over a century later two-way transmission media became popular again for music with the rise of digitality, personal computers and the Internet, based again on telephone networks. All other media of sound that came in between early telephony and the present Internet age—that is mostly the record, radio broadcasting and television are one-way storage and transmission media of sound and do not facilitate musical two-way communication practices at a distance and in real-time. That is why the study of "Distance Music" deliberately applies a time leap "From Early Telephony to Tomorrow's Internet."

A technological symbol, image or illustration of the connection between "then" and "now" is the much-overlooked yet all-pervading telephone jack as network basis.

---

[4] Author's model inspired by social scientists Kubicek and Schmidt's (1996) theory of media diffusion in combination with music sociologists Blaukopf (1989) and Smudits' (2002) theory of mediamorphosis in music.

Both users, then and now, have unique numbers of identification to send and receive audio data. The first is the traditional and often forgotten telephone number. Telephone numbers are a technological innovation developed with the commercialisation and diffusion of early telephony in the late-19th century. Then the second number is the Internet Protocol (IP) address, a technological invention developed with the commercialisation and diffusion of personal computers and the Internet in the late-20th century. Similar to telephone numbers, IP addresses are numbers unique to every computer connected to the Internet. So, the technology that connects both network numbers to send and receive audio data at a distance is the telephone jack.

Methodologically, this thesis is interdisciplinary. It fuses a broad range of theoretical and empirical approaches in the emerging tradition of sound studies. As Jonathan Sterne suggests in the *Sound Studies Reader* (2012), at first every discipline is interdisciplinary. Although my work is interdisciplinary, the main theorist I draw on is Jonathan Sterne and his work on the cultural origins of sound reproduction. I disagree with some of his positions on early telephone music and his presented theory of Ensoniment in chapter 3, which is why I will propose my own extended version of these subjects. The thesis has two empirical chapters. Chapter 4 retraces the history of telephone music between 1870-1900 in a new historical framework of media innovation and diffusion theory as proposed above in three stages: (1) the cultivation of the medium; (2) its differentiation and formalisation; and finally (3) its diffusion. By contrast, empirical chapter 5 presents an interview study with modern music technology developers on the innovation and diffusion of distance music in the present Internet age. This is portrayed, related to the historical chapter, in three stages: (1) considering the question of how digitisation has affected musician's practices, (2) the situation for musicians to perform live at a distance, and (3) the problems of a larger diffusion of distance music in the contemporary.

To historically locate the technologies used to transmit the music of the Olympic and Waldorf events, let us take a look at media historian and philosopher Frank Hartmann's work. His book *Global Media Culture* (2006) shows the historical development of some of the most influential media technologies from the 19th until the 21st century in three main phases.[5] A first such phase begins with telegraphy in the mid-19th century, emerging into a closely related technology that media historian Werner Faulstich (2004: 183-95) calls the "new medium of the telephone" in the late 19th century.[6] A second, later phase in media history concerns radio, television, and satellites of the 20th century. Here, Hartmann distinguishes the new and often discussed wireless media of mass communication, that is, radio and television, from the former wired types of media, telegraphy and telephony. Finally, the most recent phase Hartmann sees in our new interactive media technologies and environments of today's Internet. The technologies used for the Olympic and Waldorf events fall in all three of Hartmann's outlined historical phases: For the Waldorf event in 1912, the artists used the then new medium of telephone (first phase) to spread their music at a distance, whereas for the Olympic event in 1998, they drew on the latest satellite technology (second phase) and Internet technology (third phase).[7] It is self-evident that artists can only draw on the given technological means at a given historical time.

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[5] Author's translation of Hartmann's German book title: *Globale Medienkultur: Technik, Geschichte, Theorien*. All translations from German and French in the thesis will be the author's own unless otherwise stated.

The main technologies of interest in this music-in-media study are early telephony and the Internet. Although it might not seem so, there is a historical connection between music transmission on early telephone networks and on the Internet. Network music did not emerge as a completely new practice on the Internet, but in Faulstich's sense as a new media practice of telephony in the late-19th century. As technocultural theorist Frances Dyson correctly states in her book *Sounding New Media: Immersion and Embodiment in the Arts and Culture* (2009: 18-53), telephony involves a largely forgotten history of our earliest telepresence media of sound. These early media of sound heralded, I argue, our modern experience of music. Whether we download, upload, send, receive or listen to music on the Internet today, we still transmit sound data over telephone lines regardless if it is the landline at home or mobile phone on the way; most of our online connections go over the telephone. However, that telephony surprisingly represents a marginalised subject in the study of music and media, becomes most apparent from the following body of scholarship dedicated to the historical development of network music. Let us consider three of its main approaches that conceptually map what could be called *sonic netscapes* of a larger distributed sphere of music production and consumption.

Drawing on "computer-supported cooperative work" and R. Murray Schafer's soundscape studies, music technology scholar Álvaro Barbosa (2010) understands live music on electronic networks as “displaced soundscapes.” It is a “metaphorical description of the way lively generated sounds can be perceived over the Internet.”[8] The origins of displaced soundscapes Barbosa finds not in early telephony, but in the so-called Venetian “polychoral” music of the late Renaissance. In the 16th century, polychoral music originated in Italy with church choirs producing unique sound delay effects (similar to music-making on the Internet today), because the performers sang from different rooms or, as soundscape scholar Brandon LaBelle (2010) would show, different “acoustic territories” inside the architecture of St. Mark’s Basilica in Venice. Then again, the arrival of modern displaced soundscapes Barbosa (2003: 1) dates to the 1970s with the experimental network band The League of Automatic Music Composers. They pioneered a “new interaction paradigm” between performers on computer networks. Central to Barbosa’s (2006) work on displaced soundscapes is the following schematic model shown in Figure 2 below. It identifies displaced soundscapes on the space dimension by “local” and “remote” locations, and on the time dimension by “synchronous” and “asynchronous” interactions.

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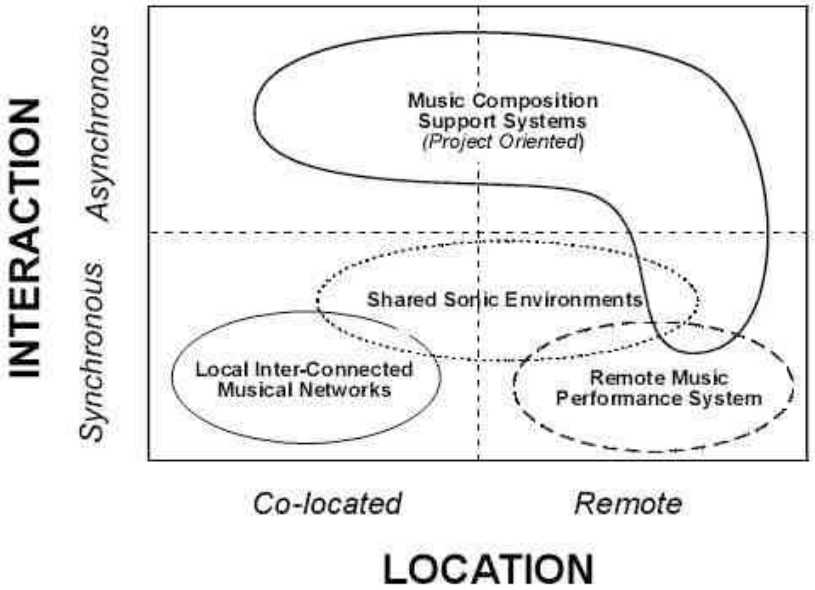
[6] Author's translation of Faulstich's (2004) German chapter title "Das neue Medium Telefon" (183-94) in *Medienwandel im Industrie- und Massenzeitalter, 1830-1900*, Vandenhoeck & Ruprecht, Göttingen.

[7] See Alexander Carôt's (2009: 7) "History of IT Music Performances," in *Musical Telepresence-A Comprehensive Analysis Towards New Cognitive and Technical Approaches*, Institute of Telematics, University of Lübeck, Germany.


INTERACTION
Asynchronous
Synchronous
Music Composition Support Systems (Project Oriented)
Shared Sonic Environments
Local Inter-Connected Musical Networks
Remote Music Performance System
Co-located
Remote
LOCATION

[Fig. 2] Álvaro Barbosa’s Model of Displaced Soundscapes, 2006. It represents four different types of displaced soundscapes on the Internet: “Music Composition Support Systems,” “Shared Sonic Environments,” “Local Inter-Connected Musical Networks,” and “Remote Music Performance Systems.” Both the time variable “interaction” (synchronous versus asynchronous) and the space variable “location” (co-located versus remote) are the determining factors in this model.[9]

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[8] Quoted from Álvaro Barbosa’s (2010) lecture “Public Sound Objects,” at “Network Musical Performance Workshop: Technical and Artistic Strategies to Perform Around the Globe,” Center For Computer Research in Music and Acoustics, Stanford University, California, available at https://ccrma.stanford.edu/workshops/nmp2010/ (April 2012).

[9] Álvaro Barbosa (2006: 42) *Displaced Soundscapes: Computer-supported Cooperative Work for Music Applications*, Department of Technology, Universidad Pompeu Fabra, Barcelona. See also Barbosa (2003).

Let us take a closer look at Barbosa's (2006) model of displaced soundscapes and its category of "remote music performance systems" (on the bottom right in Figure 2). What this category suggests are "groups of multiple remote performer/users, displaced in space, improvising and interacting synchronously" (57-69). If we were now to look again at the aforementioned historical Waldorf event using Barbosa's category of "remote music performance systems," then one could say that Waldorf switched live on site of the hotel various performers from New York City, Hot Springs, and Boston. This means the performers were "remote performers" who used telephones instead of computers as their main "performance systems." Whereas one remote performer recited a Rudyard Kipling poem over the phone, another performer sang a southern song. Yet it remains unclear whether the telephone performers perhaps spontaneously "improvised and interacted" with one another similar to the "groups of multiple remote performers" during the Olympic event. Even if Waldorf featured "displaced" performers, they did not found displaced soundscapes in Barbosa's sense, as each performer seemed to convey individually, one after another, his or her creative share to the audience. Yet, significant about the Waldorf event—besides its spatially distributed performers—is the transformation of the telephone from its original purpose as distant human interaction medium into that of an early broadcasting medium.

What Barbosa calls displaced soundscapes, similarly music technology scholar Gil Weinberg (2005) calls "interconnected musical networks."[10] For its historical development, he suggests three phases: A first, which does not begin with polychoral music in the 16th century, but instead with "analogue electronics" around the 1950s; followed by, as Barbosa also suggests, computers in the 1970s; and finally the Internet with related interactive technologies today. For analogue electronics, Weinberg particularly finds John Cage's 1951 piece "Imaginary Landscapes No. 4" as a milestone in the development of interconnected musical networks; Cage's piece featured twelve radios, 24 performers and a conductor. As Weinberg puts it, "there were the interdependent interactions between the players and the network of radio stations," and the piece "supported intra-player interdependencies since for every frequency-dial player there was a volume-dial player who could manipulate the final output gain" (27-8).[11] Like Barbosa, Weinberg conceptually frames different types of interconnected musical networks. One of them, useful for the Olympic event, he calls the "bridge approach." Since all groups of performers for the Olympic event interacted from different locations, all technologies in use aimed at "bridging the distance between remote participants, allowing them to play, improvise, and listen to music in a way similar to a traditional 'jam session'" (27) in the same location.

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[10] Gil Weinberg (2005) "Interconnected Musical Networks: Toward a Theoretical Framework," in *Computer Music Journal*, vol. 29, iss. 2, pp. 23-39. See also Weinberg (2002, 2003, 2005a).

Closely related to displaced soundscapes and interconnected musical networks is a concept that media studies scholar Golo Föllmer (2005) calls "net music."[12] It "comprises all formal and stylistic kinds of music upon which the specifics of electronic networks leave considerable traces" (185). Föllmer too sees the actual beginning of net music in the practices of John Cage, but mainly in The League of Automatic Music Composers applying creativity to electronic networks as means of musical expression. Similar to Barbosa and Weinberg, Föllmer also proposes his version of a conceptual model of net music graphically outlined in Figure 3 below. It distinguishes a number of different types and clusters of net music. If we recall the Olympic event in the light of Föllmer's model, then its cluster V and type "L" for "staged projects" seem relevant. They involve a high level of "complexity"—given that the Olympic event brought together musical performers from across the world. But at the same time, cluster V and type L also mean a low level of "interplay" and "openness" as to the "degree of interactivity offered to the listeners" (188). Föllmer's model below helps us to schematically explain network musical events such as Seiji Ozawa's performance of "Ode to Joy" on five continents and six cities at the same time.

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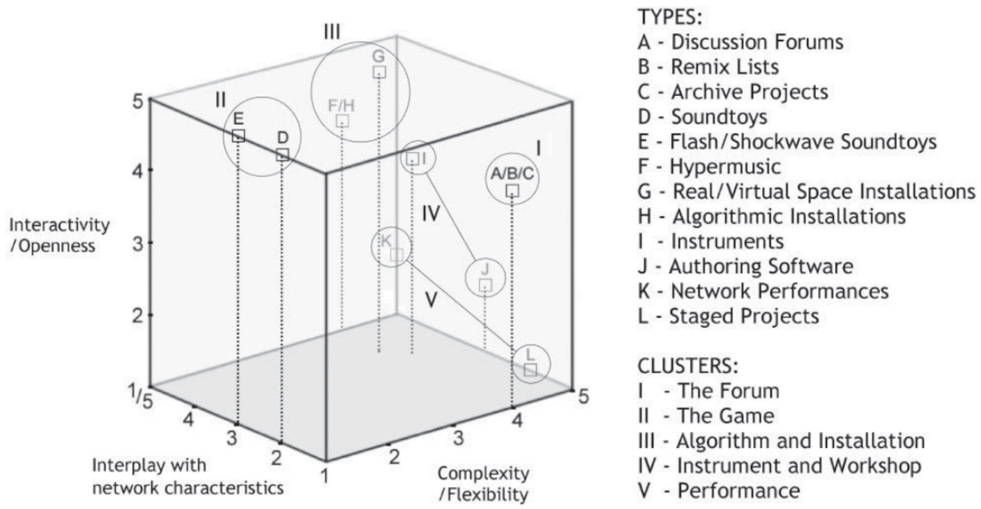
[11] Also John Cage's later compositions "Imaginary Landscapes No. 5" (1952), "Speech" (1955), "Music Walk" (1958) and "Cartridge Music" (1960) represent early interconnected musical networks in Weinberg's sense.

[12] Golo Föllmer (2005) "Electronic, aesthetic and social factors in Net music," in *Organised Sound*, vol. 10, iss. 3, pp. 185-92. See also Föllmer (2001, 2001a, 2004, 2004a, 2005a, 2008).


III
II
I
IV
V
5
4
3
2
1/5
Interactivity /Openness
E
D
G
F/H
I
A/B/C
K
J
L
4
3
2
1
2
3
4
5
Interplay with network characteristics
Complexity /Flexibility
TYPES:
A - Discussion Forums
B - Remix Lists
C - Archive Projects
D - Soundtoys
E - Flash/Shockwave Soundtoys
F - Hypermusic
G - Real/Virtual Space Installations
H - Algorithmic Installations
I - Instruments
J - Authoring Software
K - Network Performances
L - Staged Projects
CLUSTERS:
I - The Forum
II - The Game
III - Algorithm and Installation
IV - Instrument and Workshop
V - Performance

[Fig. 3] Golo Föllmer's model of net music, 2005. It seeks to explain participatory music on the Internet through twelve types (A-L) and five clusters (I-V) of net music measured by the variables "Interactivity/Openness," "Interplay with network characteristics," and "Complexity/Flexibility" on a scale of 1 to 5.[13]

Despite the utility of Barbosa's, Weinberg's, and Föllmer's above-outlined conceptual models of sonic netscapes, they also face some shortcomings. I already hinted at what Dyson (2009: 7) identified as the "denial of the original phone that made sense of the first telepresent technology" altogether.[14] It is a weakness of the outlined body of scholarship to embark historically without the telephone on board. This is because early telephony made sense of both the first live music transmission medium and the first telepresence technology for artists. Besides a marginalised history of telephone music, another shortcoming of the scholarship is its technology-centred view in the conceptualisation of sonic netscapes. This may be partly true since technologies are crucial to music; however, their top-down view is too dominant in crediting chiefly the effects of technologies on music, leaving open its origins. Cultural historian Jonathan Sterne in *The Audible Past* (2003) would ask more fundamentally, where do these sound technologies come from in the first place? Finally, a last shortcoming involves the extremely mechanical framing of sonic netscapes. Such framing may be useful to some extent, but there is more to the field than simply static categories of description, trying to squeeze all possibly existing networked musicality into a box. Some critics may feel claustrophobic when caged into a system seeking to understand a constantly transforming sphere of relations in music and technology.

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[13] Föllmer (2005: 189).

[14] Informatics and media theorist Julian Rohrhuber (2007) notes the historical importance of telephony for music transmission in his chapter "Network music" (140-56), in *The Cambridge Companion to Electronic Music*, eds. Nick Collins and Julio d'Escriván, Cambridge University Press, Cambridge, United Kingdom.

Earlier versions of this thesis were titled “Distributed Musicsphere” instead of its current title “Distance Music.” I decided to rename it because the term “sphere” seems unclear like the future of music, and the existence of a sphere is also difficult to describe. However, let me try to explain what distributed musicsphere suggests, because it adds value to the further discussion. “Distributed” alludes to the engineering concept of cloud computing and spatially dispersed operating systems, applied here in a musical context of bringing together spatially dispersed creative and technological resources for musicians to share at a distance.[15] “Sphere” in distributed musicsphere refers to Sterne’s (2003) concept of sound being mostly “spherical” in nature (15), and that we can detect and perceive sound from different sides, not just one. If we turn our back to a concert stage, we cannot see the musicians anymore but we can still listen to their music. The point is that during a distributed musical setting, different spheres of music—namely those in each artist’s location—electronically fuse or melt into one distributed musicsphere where the performers interact all together at a distance, such as during the Olympic event. In that sense, Barbosa’s “displaced soundscapes,” Weinberg’s “interconnected musical networks,” and Föllmer’s “net music” define the sonic netscapes of a larger distributed musicsphere.

Yet, instead of a mere description of the situations in which distance music occurs, this study raises more theoretical and historical questions about it. For example, how does the subject of distance music relate to media discussions on musical liveness, sound reproduction, and technological development? How did the first interactive medium of sound develop historically? Whom did this development involve? How were early transmission networks wired for sound? Who organised and controlled them? What kinds of problems did the early transmissions of live music by telephone involve, and how did early network performances affect the human sensory experience of listening to music? What impacts do sound media have on human beings? Do they make artists musically freer? Did telephone music lead to more dependency or autonomy of its users? To what degree does the historical development of telephone music inform our present situation of distance music on the Internet? Who are the key players and what are their efforts in the development of the technologies for distance music? What are the downsides of distance music today?

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[15] See computer scientists Andrew S. Tanenbaum and Maarten van Steen (2007) in *Distributed Systems: Principles and Paradigms*, Prentice Hall, New Jersey.

Note again: this music-in-media study does not just provide a descriptive account of the latest technologies and situations of distance music. Such an account would be exhausted quickly. Instead, the objective here is to offer a critical and wide-ranging media account on the relationship between four main ideas on the subject of distance music: (1) (conceptually) transformations in music and technology; that the relationship between music and technology is largely inseparable and impermanent or of transient nature; (2) (media historically), that the age of electroacoustic music transmission began much earlier than commonly perceived, not with radio, but instead with early telephony; (3) (media theoretically), that telephony involves, as compared to other media of sound, a high degree of human self-determination. In other words, a third objective is to show from the theoretical standpoint of the media the significance of telephony for distance music as a comparatively 'neutral' medium. It is historically the only medium of sound that enables—as opposed to the often discussed mass media of gramophone and radio—a largely independent creation of musical content at a distance and in real time, without a content-determining industry in between the artists. The last objective (4) is to (empirically) show a digital divide in distance music today. I will elaborate each of these points in more detail in the following chapter breakdown.

Chapter 2 provides a conceptual overview on the subject of transformation in music and technology. Part one of the chapter critically examines technology-related concepts of *liveness*, technological *reproduction*, and *interaction* and *perception* of music, examining the ideas of thinkers R. Murray Schafer, Michael Chanan, Pierre Schaeffer, Walter Benjamin and Theodor W. Adorno. Starting with a passage on musical performance in Kafka's "The Metamorphosis," I consider the problem of defining the nature of musical performance in the light of the ambiguous ideas of musical liveness and reproduction. Where can we draw the lines between live and reproduced sound; where do they overlap? Can a sound reproduction be performed live? And how do live and reproduced sound relate to musical telepresence? I take the position that when musicians agree that prerecorded sound material is a part of their artistic expression, then our conceptual thinking about musical performance ought to reflect these changes of a new cross-breed between live and reproduced sound—what I will suggest, among other things, as "imagined" musical interactions. Especially in musical telepresence, the lines between live and reproduced sound are heavily blurring; for remote performers both create and circulate music on electronic networks and perceive it exclusively in technologically reproduced modes. That is why I then examine in Walter Benjamin's thinking on technological reproduction and *aura*, whether musical performers in telepresence may experience aura too. I stress that the experience of aura or immersion into music is a highly subjective experience, which each human being feels differently—despite any engaged reproductive technology.

Part two of the chapter walks through different ideas on the origins and repercussions of sound technologies. It starts with a cybernetic concept by W. Ross Ashby on the nature of transformation generally as a form of *difference* between an "input" and "output"—that is, in other words, how a given type of energy transforms from one state into another such as acoustic sound waves into electrical currents, and back again. Ashby's account on transformation is instructive, for it will enable us to better relate to and understand the nature of transformations in music and technology. In view of technology's effects on music (framed as "output" perspective), the chapter, then, portrays two identically named, but thematically different theories of transformation called *mediamorphoses.* One is in sociology of music by Kurt Blaukopf and Alfred Smudits, the other a diffusion theory of digital media by Roger Fidler. Both theories of mediamorphoses identify large historical phases or morphs, where different types of media technologies such as mechanical phonography or (important here) electric telephony, the digital computer, and the Internet have profoundly transformed the world of music.

Having considered technology's "output" side, the chapter then switches perspectives and looks at technology's "input" side—its origins. Starting from the assumption that virtually all forms of music-making demand technology in some form, a problem is that one cannot simply take the existence of these technologies for granted that they, so to speak, fall out of the sky. But where do they come from? In Sterne's sense, I take the position that music technologies always involve and relate to other, preceding ideas through some form of a knowledge transfer (as detailed in chapter 4 for the historical case of telephone music). In other words, a systemic or circulatory relationship between the origins and effects of music technologies or its input and output is active here, as opposed to a one-sided view on only a technology's output. Cultural theorist Jody Berland takes such a one-sided or unbalanced view, saying that digital technologies caused or pushed musical performance into a condition beyond music she calls "postmusic." I disagree with

Berland’s position and will explain why it paradoxically skews the historical relationship between music and technology. All told, chapter 2 illustrates that the relationship between music and technology is largely inseparable and always changing.

Chapter 3 draws on Jonathan Sterne’s (2003) theory of “Ensoniment” in relation to distance music. Sterne understands the term Ensoniment as the sonic equivalent to the Age of Enlightenment. With Ensoniment, he emphasises that in addition to the dominant media of sight or light (as reflected in the term En*light*enment), those of sound also played a pivotal role for humans in their path of “becoming modern” (3). Taking Sterne’s understanding of Ensoniment as the starting point in the discussion, the chapter then points to a shortcoming, namely that Sterne ascribes Ensoniment only to a particular historical epoch, age, or period. What he tends to neglect is the underlying philosophical *idea* of it, different from historical epoch-making. That is why this chapter differentiates the historical Age of Ensoniment (capitalised) from what I understand as the idea of ensoniment (lowercased). The objective of this chapter is to develop the idea of ensoniment in the sense of a striving of human beings for sonic independence in their use of sound media. I stress that, unlike with gramophone and radio, with telephony there had already existed a possibility for human beings—in a way similar to what we observe on the Internet today—to independently and creatively determine media contents themselves at a distance.

Further, the idea of ensoniment involves two opposing notions: one I call *sonic heteronomy* and the other *sonic autonomy*. With shades of gray in between, they theoretically distinguish the possible effects of different types of sound media on human beings. Sonic heteronomy involves those sound media with their contents created and delivered or acted upon people by external providers, often powerful industrial carriers of cultural beliefs. Analytically, I will explore the notion of sonic heteronomy by fusing some early pessimistic science fiction writing on future music by Jules Verne, Marshall McLuhan on acoustic space, and the ancient philosophical idea of enlightenment in Plato’s Cave Allegory. I point critically to some of the strengths and weaknesses in these thinkers’ frameworks for understanding the regimes of non-autonomous or heteronomous sound in today’s world.

In contrast with sonic heteronomy, sonic autonomy suggests that telephony enables greater creative autonomy on the part of human subjects. Using telephony, people can largely determine their own content jointly with other active participants in the network. Musical telephone jammers in the late 19th century were the creative prototypes of this early networked sound culture. Both The League of Automatic Music Composers in the 1970s, followed by The Hub, embody later historical cases of such creativity. Analytically, the notion of sonic autonomy combines philosophical ideas on enlightenment thinking by Immanuel Kant and Ralph Waldo Emerson, with writing on computer network music by The League of Automatic Music Composers and The Hub. In addition, a brief behavioural psychological model seeks to explain why people act independently and become musically creative in electronic networks at all. Altogether, chapter 3 suggests the idea of ensoniment as one of a striving of human subjects from sonic heteronomy towards sonic autonomy. It is an idea about the way modern life becomes progressively wired for sound.

Chapter 4 details one particular case in the history of music transmission: telephone music. In the late-19th century, music transmission was not just a vision of science fiction anymore; there was already an eventful telephone music culture. It grew out of musical telegraphy from about the 1870s. In the United States and Europe there were countless telephone concerts, and since about the early 1890s larger European cities had specific media start-up companies offering telephone entertainment programmes such as live music based on subscription. A problem in the writing of media history is that scholars refer to telephone music, if at all, as a minor development in media history. In Particular, Jonathan Sterne's (2003) perspective on the history of telephone music characterises it as just "experimental." I disagree with his view on the medium, and argue instead for a revisionist historical approach that telephone music did not just stay that way. Analytically, I retrace the development of early telephone music between 1870 and 1900 in the framework of media-diffusion theory. It suggests three stages in the development of a new medium—cultivation, differentiation, and cultural diffusion. In sum, chapter 4 shows the creation of a new musicsphere before the turn of the 20th century. Being aware of early telephone music deepens our understanding of the origins of distance music, and also provides an alternative view to the dominant histories of gramophone and radio.

Chapter 5 explores the current situation of digital music-making on the Internet. It provides a rich compilation of interview excerpts with leading manufacturers of music technologies, including the makers of Pro Tools and Ableton Live, both widely used in music-making today. Of interest are the questions of how these technologies affect musicians' practices, and what role the Internet plays in this regard. First, the interviewees will explain why and how digital technologies truly revolutionised music-making, and also draw attention to the downsides and limitations of this revolution on the Internet. Of course, the Internet plays a crucial role in music today; it is full of the latest participatory Web 2.0 environments provided by musical services such as Digital Musician or eJamming. Both of these enable musicians to share music and collaborate online. However, my point in this chapter is that effective live musical performance on the Internet still represents a marginal cultural practice, although distributed music making on electronic networks has existed since the beginning of music transmission in the late-19th century. Today only certain cultural elites have the resources to jam efficiently online, excluding most others. Chapter 5, then, reveals a digital divide in contemporary music-making between those who have access to key media in the field and those without access.

Put succinctly, this music-in-media study is about what I call "distance music." Chapter 2 provides a concept of the media that gives us a context in which to understand distance music. It does this within a framework of ideas on transformations in music and technology. Chapter 3 takes a hard look at Jonathan Sterne's discussion of Ensoniment or sonic Enlightenment in relation to distance music. Chapter 4 follows with a thorough background on early telephone music to provide a foundation in media history. This, in turn, helps us understand the present situation of distance music. Chapter 5 provides interview material with leading manufacturers of digital music technologies on the present situation of distance music including a speculative outlook on possible future developments towards a larger distributed musicsphere. Finally, the conclusion weaves together some of the main points discussed throughout this study.

2. Transformations in Music Culture and Technology

> Today, the young generation—I don't think you can find a guitar player or a musician who isn't into electronics in some form because he's got to record. To record he's got to know what a microphone is. He's got to know what he is doing with synthesisers and all those funny boxes hooked in between the guitar and the amplifier. The fellow has to be somewhat knowledgeable in the electronics industry.
>
> Guitarist Les Paul in *The Wizard of Waukesha* (1979).[16]

Introduction

Since the late-19th century, the world of music has been transformed through the technological innovation of sound reproduction. Audiences became scattered groups that can choose to listen to reproduced music wherever and whenever they want. Yet, the innovation of sound reproduction has also transformed music making itself. Today, in network music on the Internet and in music making generally, the lines between what we commonly perceive as 'live' and 'reproduced' have blurred to where they are almost indistinguishable.

The first part of this chapter analyses the blurring lines in music making through different concepts of liveness and reproduction. I will discuss the ideas of theorists Stan Godlovitch, Michael Chanan, R. Murray Schafer, Pierre Schaeffer, Jonathan Sterne, Philip Auslander, Theodor W. Adorno, and Walter Benjamin, among others. Deliberating on their ideas of liveness and reproduction, I maintain that in essence, everyone hears and experiences live and reproduced sound differently—despite any degree of massification, repetition, and standardisation of the human perception of sound in the face of technological reproduction. In view of the conceptual problem of distinguishing live from reproduced sound in music-making, the chapter suggests observing them instead as what I later define as *direct*, *distributed,* and *imagined* musical interactions.

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[16] Author's transcription from documentary film *The Wizard of Waukesha: A Film about Les Paul* (1979), directed by Catherine Orentreich, Stray Cat Productions, 58 min., United States.

Part two of this chapter, "Input and Output," deals with different concepts of technologies. I will look at these concepts in two perspectives: Whereas the first perspective follows a rather media-centric line of reasoning in the sense of technology's output or effects on music, by contrast, the second perspective is about the input or origins of a technology. Jonathan Sterne (2009) would explain the input perspective with what he calls "philosophical reverse engineering."[17] It refers to the fact that scholars, besides disassembling a technology for its material components of engineering, can also trace a technology's sociocultural components. For example, in sound studies, Trevor Pinch and Frank Trocco (2002) philosophically reverse engineered the Moog synthesiser. Relevant for the input perspective are ideas in sound studies and in media studies, including those of German media theorists Hartmut Winkler and Friedrich Kittler. Then, for the output perspective, the chapter considers W. Ross Ashby's cybernetic concept of "difference." It explains the nature of transformation in general. On transformations in music and technology in particular, I then take into account the sociology of music, specifically Kurt Blaukopf and Alfred Smudits' theory of mediamorphoses. It relates to another theory of the same name—mediamorphosis (singular)—by media theorist Roger Fidler, focussing on digital technologies so important in music-making today.

When setting forth these above-outlined perspectives of "input" and "output," I argue that transformations in music and technology ideally take root in the social sphere, and not in the technological alone. Instead of being discrete entities, music and technology go together as largely connected, intertwined, and inseparable phenomena. A possible exception would be vocal chanting. Cultural theorist Jody Berland (2008) sees the human touch in the relationship between music and technology endangered as ever more musicians integrate reproductive technologies in their performances—a cultural development she refuses to accept and utterly condemns as "postmusic." I oppose Berland's idea of postmusic and hold that—even if technologies affect music in many ways—critics should pay attention to a technology's human input, its origins, and what they mean.

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[17] The term "reverse engineering" is also used in drumming to describe when performers reverse computer-generated rhythms to play them instead on acoustic drums—a technique popularised by drummers Jojo Mayer in The Nerve, and Johnny Rabb in BioDiesel. However, reverse engineering is primarily a computational concept developed by Elliot J. Chikofsky and J. H. Cross (1990) "Reverse Engineering and Design Recovery—A Taxonomy," in *IEEE Software*, vol 7, iss 1, pp. 13-7. See also Eilam (2005), Hainaut (2005: 22).

2.1. Transformations in Music Culture

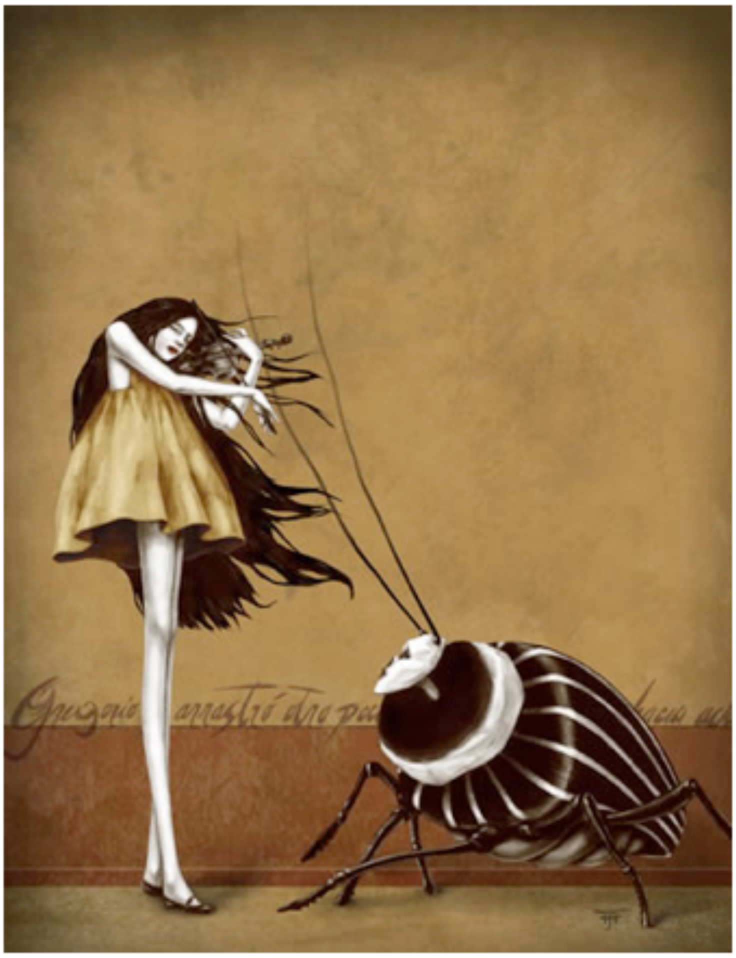
2.1.1. Live and Reproduced Music

"One morning, when Gregor Samsa woke from troubled dreams, he found himself transformed in his bed into a horrible vermin." This is how Franz Kafka introduces the subject of transformation in his famous novella "The Metamorphosis" (1912). Since Gregor Samsa underwent a transformation from human to insect, he is incapable of ensuring the Samsas' economic survival; thus, the whole family faces a transformation when trying to adapt to their new living situation. The Samsas chose to sublet rooms in their house to three gentlemen whom now—instead of going to the expensive music conservatory—Gregor's sister has to entertain with her violin. This is illustrated by expressionistic Argentinean artist Fernando Falcone in Figure 4 further below. Kafka describes one such musical occasion in this way:

> No-one noticed him, though. The family was totally preoccupied with the violin playing; at first, the three gentlemen had put their hands in their pockets and come up far too close behind the music stand to look at all the notes being played, and they must have disturbed Gregor's sister, but soon, in contrast with the family, they withdrew back to the window with their heads sunk and talking to each other at half volume, and they stayed by the window while Gregor's father observed them anxiously. It really now seemed very obvious that they had expected to hear some beautiful or entertaining violin playing but had been disappointed, that they had had enough of the whole performance and it was only now out of politeness that they allowed their peace to be disturbed. It was especially unnerving, the way they all blew the smoke from their cigarettes upwards from their mouth and noses. Yet Gregor's sister was playing so beautifully. Her face was leant to one side, following the lines of music with a careful and melancholy expression. Gregor crawled a little further forward, keeping his head close to the ground so that he could meet her eyes if the chance came. Was he an animal if music could captivate him so? (31)

To examine Kafka's portrayal of the musical occasion in more detail, let us consider music philosopher Stan Godlovitch's (1998) so-called "constituents of performance." Godlovitch understands musical performance as a complex network of actions that simultaneously draws together "live" sound sequences created by human "agents," musical "works," and "listeners" (13-48). Of course, Gregor's sister embodies a human "agent." What Kafka does not tell us is the musical "work" the agent plays on her violin. By contrast, Spanish filmmaker Carlos Atanes' *La Metamorfosis de Franz*

Kafka (1993), a film adaptation of Kafka's novella, shows Gregor's sister poorly playing a theme of Beethoven's 5th Symphony on the violin, accompanied by one gentleman on the piano. Obvious "listeners" in Godlovitch's sense of musical performance are in both Kafka and Atanes' versions of the story the gentlemen, Gregor's sister, and the Samsa family. However, in Godlovitch's sense, the violin performance does not seem complete, for Godlovitch understands a "performance integrity" (34) only given through an uninterrupted performance. Though Kafka does not say Gregor's sister played a wrong note, he writes that the gentlemen must have "disturbed" her when coming up "far too close behind the music stand to look at all the notes being played." Whereas the human expectations about a complete musical performance ("some beautiful or entertaining violin playing") remained unfulfilled, by contrast, the only nonhuman listener, Gregor, was even "captivated" by the music.



[Fig. 4] Argentinean artist Fernando Falcone's illustration "Metamorfosis," 2005.[18]

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[18] Falcone's (2005) illustration "Metamorfosis," available at http://www.fernandofalcone.com.ar (April 2012).

In a wider sense of music history, both humans and animals relate to musical performance.[19] Music historians argue that music itself probably began with humans "imitating animal sound" (Rademacher 1995: 8)—whereas humans today may simply capture and reproduce animal sounds to perform music with them.[20] Classic literature portrays even how animals themselves perform music. In "The Musicians of Bremen" (1819), the Grimm Brothers tell how four animals perform "their music" in front of some burglars' kitchen window: "the donkey brayed, the dog barked, the cat meowed, and the cock crowed" (102-4).[21] Thomas Hankins and Robert Silverman describe a cruel case of animal music in their book *Instruments and the Imagination* (1999): In the 17th century, living cats "whose natural voices were at different pitches" were arranged side by side into a little piano. Depending on the keys an artist struck, a "mechanism drove a sharp spike into the appropriate cat's tail. The result was a melody of meows that became more vigorous as the cats became more desperate" (73).[22] Perhaps the bored Italian prince for whom an inventor had built the cat piano, even liked the strange sounds one could play with it. My point is that Godlovitch's above notion of a complete or incomplete musical performance seems problematic: Each party involved in the occurrence of music—that is, sound organised in time—tends to embody a distinctive experience.[23] What musically feels complete to one, like Gregor, might feel incomplete to another.

Suppose Gregor's sister had not performed live, but instead technologically reproduced her violin playing off a gramophone record. Then also Kafka's above portrayal of the musical occasion would have been different. Nobody in the immediate vicinity of Gregor's sister (the three gentlemen, Gregor, and the rest of the family) could have disturbed, as musicologist Philip Tagg (2002) might say, her "concerted simultaneity" (4) when approaching, as Kafka writes, "far too close behind the music stand to look at all the notes being played." On the other hand, a reproduction of her violin playing would have changed the role of Gregor's sister from performer to listener. As Michael Chanan put it in his book *Repeated Takes: A Short*

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[19] See Carol L. Krumhansl (2005: 1-3) "Ethology/Evolution—Do Animals Have Music or Something Else?" in *The Neurosciences and Music II: From Perception to Performance*, eds. Giuliano Avanzini and Luisa Lopez, The New York Academy of Sciences, New York. Also Cross (2005: 3-6), McDermott/Hauser (2005: 6-17), Merker (2005: 17-29), Fitch (2005: 29-50).

[20] Ethnomusicologist Bruno Nettle (2005: 18) says, "many people accept any sound as music, including animal sounds."

[21] Other Grimm (1819 [1977]) tales related to media include "The Drummer" (590-8) and "The Singing Bone" (104-6).

[22] Also Sterne (2009) "The Cat Telephone," in *The Velvet Light Trap*, vol. 64, Fall iss. pp 83-4, and Sterne (2007).

[23] Music philosopher R. A. Sharpe (2000: 126-58) highlights "expression," "technique" and "authenticity" in musical performance, in *Music and Humanism: An Essay in the Aesthetics of Music*, Oxford University Press, New York.

History of Recording and its Effects on Music (1995), sound recording enabled musicians to “hear themselves as others hear them” (7). Here, Chanan does not contend that all musicians listen in their different emotional ways in the sense of an ‘everyone hears it differently ideology’ that nobody can perceive music exactly in the same way as another person. Instead, Chanan mainly reasons that sound recording enabled musicians to discover their own performance in a different way—a standardised or objectified experience nearer, if not perfectly identical to, that of the listener. If she would have technologically reproduced it, Gregor’s sister would have become a different type of listener to her own violin playing.

In soundscape studies and acoustic ecology, R. Murray Schafer’s (2004: 34) understanding of sound reproduction differs from that of Chanan. Schafer understands it as “schizophonic” in the sense of an ‘ill’ acoustic divide, a “split between an original sound and its electroacoustical transmission or reproduction.” Reproduced sound is schizophonic because “originally all sounds were originals,” Schafer puts, “they occurred at one time and in one place only. Sounds were then indissolubly tied to the mechanisms which produced them. The human voice travelled only as far as one could shout. Every sound was uncounterfeitable, unique” (34). Central to Schafer’s theory is different types of sounds constantly surround humans like a “vast musical composition which is unfolding around us ceaselessly” (29). Whether these sounds are, Schafer (1977: 274-5) points out, “pleasant and unpleasant, loud and soft, heard or ignored” like bird song or cars, they are acoustic realities “that we all live with.” As Schafer divides original sounds from reproduced sounds, he also divides the sounds of the entire world into a division of good versus bad sounds he calls hi-fi (high fidelity) and low-fi (low fidelity) soundscapes. Inspired by psychoacoustics, that is the scientific study of sound perception, particularly frequency masking in high fidelity sound, and quadraphonic sound, Schafer argues, a “hi-fi soundscape is one in which discrete sounds can be heard clearly because of the low ambient noise level.” Nature sounds are hi-fi as these are “surrounded by pools of stillness.” For instance, a “shepherd … can determine from sheep bells the precise state of his flock” (ib.). On the contrary, in a “low-fi soundscape individual acoustic signals are obscured in an overdense population of sounds” (32). People-made sounds of technological reproduction thus have a low standing in Schafer’s thinking.

With schizophonia and low-fi soundscapes, Schafer provides a negative image of sound reproduction. By contrast, Pierre Schaeffer, the sound engineer and founder of *musique concrète*, offers a more constructive, promising idea of it.[24] Schaeffer (1966: 76-82) identifies sound reproduction, compared to R. Murray Schafer, in a rather unbiased or neutral way as "acousmatic" experience. Like Schafer's schizophonia, also Schaeffer's (2004) acousmatic sound refers to "a noise that one hears without seeing what causes it" (77). However, a key difference is that Schaeffer does not simply see it as a mirror reflection of a supposedly better original, but as a noise or sound with a new reality. In a phenomenological sense, he understands it as objectified sound through reproductive technologies, enabling a new acoustic experience that is distinct from that of the source of the sound. "We have at our disposal the generality of sounds … without having to produce them," Schaeffer puts, "all we have to do is push the button on a tape recorder. Deliberately forgetting every reference to instrumental causes or preexisting musical significations, we then seek to devote ourselves entirely and exclusively to listening," (81), that is, the acousmatic experience.[25] In terms of soundscape studies and Schafer's idea of the schizophonic experience, I agree with Jonathan Sterne's (2003) criticism that Schafer defines "sound reproduction negatively, as negating or modifying an undamaged interpersonal or face-to-face copresence" (20). One cannot take for granted that the cultural practice of sound reproduction produces a schizophonic listening experience, as if it were an acoustic hallucination of another here and now.

In his influential essay "The Work of Art in the Age of Mechanical Reproduction" (1936), Walter Benjamin does not completely, as the sociologist of music Alfred Smudits (2002: 56) claims, "ignore" ("ignorierende Haltung") music.[26] Though Benjamin's principal objects of study are film and photography, he also refers to sound reproduction and the acoustic culture in his artwork essay. Benjamin compares how reproduced art "comes towards the beholder or listener, be it in the form of photography, be it in that of a gramophone record. The cathedral is leaving its place to be perceived in the art lover's studio; the choral work, which had been executed in a concert hall or in the open air, can be heard in a room" (12-3).

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[24] Randolph Jordan (2007) states that "acousmatic" evokes positive and "schizophonic" negative connotations in "Case Study: Film Sound, Acoustic Ecology and Performance in Electroacoustic Music" (121-45), in *Music, Sound and Multimedia: From the Live to the Virtual*, ed. Jamie Sexton, Edinburgh University Press, Edinburgh, Scotland.

[25] On Pierre Schaeffer's music that uses environmental sounds recorded on magnetic tape, see Paul Griffiths' (1979) section "The Dawn: Musique Concrete" (12-3), in *Electronic Music*, Thames and Hudson, London. Also Holmes (2008: 41-78), and Ashby (1956: 116-7) on magnetic tape and memory.

[26] Benjamin did write about sound media. There is a recent edition of The Work of Art in newish English translation including his writings "The Telephone" (77-8) and "Reflections on Radio" (391-3) in *The Work of Art in the Age of Its Technological Reproducibility, and Other Writings on Media* (2008), eds. Michael W. Jennings, Thomas Y. Levin, Brigid, Doherty, Harvard University Press, Cambridge, Massachusetts.

Benjamin's analogy seems to indicate that reproductive technologies also transformed audible art from its genuine or traditional "single occurrence" in the same here and now to a new space and time continuum of its "mass occurrence" (13).[27] Anyone wanting to listen to a "symphony" (20) is no longer obliged to be part of the traditional audience on site. Instead, now many audiences can consume daily as much or as little as they desire of what Simon Frith (2003: 93) calls the ubiquitous "canned music" and "piped music."

With respect to technologically reproduced music, it is useful to consider also Benjamin's notions of "concentration" and "distraction" (40). "Distraction and concentration stand in contrast to each other, allowing the following formulation: The one who gathers in front of an art work immerses himself into it; he sinks into this work ... On the other hand, the distracted masses for their part sink an artwork in themselves" (40).[28] In acoustic art, the notion of concentration or an immersed perception into music, would relate, in Benjamin's thinking, to the supposedly 'original' and unique live performance that preceded its mass-reproduced recording. I am not saying that Benjamin follows a largely nostalgic line of reasoning about a loss of concentration in favour of distraction through sound recording. He is open and optimistic about the possibilities and political potential of technological reproduction against its fascist uses in the 1930s, when he wrote his Art Work essay. At this point and later on (in the discussion on musical telepresence and aura), it is noticeable that Benjamin—as compared to Pierre Schaeffer—does not take objectified or technologically reproduced music as point of reference in the sense of a new original. What he takes instead as point of reference is the memory of the past musical performance that preceded the recording.

In 1938, Benjamin's notions of concentration versus distraction fascinated another critical observer of mediatised music, Theodor W. Adorno. In his essay "On the Fetish-Character in Music and the Regression of Listening," he responded to Benjamin's Art Work essay acknowledging, "Benjamin's reference to the apperception of the cinema in a condition of distraction is just as valid for light music"

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[27] Author's translation from German. Above: "Vor allem macht sie ihm möglich, dem Aufnehmenen entgegenzukommen, sei es in Gestalt der Photographie, sei es in der der Schallplatte. Die Kathrale verläßt ihren Platz, um in dem Studio eines Kunstfreundes Aunahme zu finden; das Chorwerk, das in einem Saal oder unter freiem Himmel exekutiert wurde, läßt sich in einem Zimmer vernehmen." Below: "einmaligen Vorkommens" and "massenweise." Note, I translated Benjamin's ambiguous term "Aufnehmender" as "beholder or listener." Also "um in dem Studio eines Kunstfreundes Aufnahme zu finden" is ambiguous; it can mean the choral work to be 'recorded' or 'perceived' in a studio, and the term "studio" can refer to both an art studio or a sound studio.

[28] Author's translation from German: Above: "Sammlung" and "Zerstreuung." Below: "Zerstreung und Sammlung stehen in einem Gegensatz, der folgende Formulierung erlaubt: Der vor dem Kunstwerk sich Sammelnde versenkt sich darein; er geht in dieses Werk ein … Dagegen versenkt die zerstreuete Masse ihrerseits das Kunstwerk in sich."

(288). Mentioning Benjamin's notion of distraction—though without its equivalent of concentration—Adorno instead sought to advance his own version of the two opposing poles applied to the perception of music: He calls it "musical fetishism" (277) versus the "regression of listening" (285). Where musical fetishism is about the cultural tradition of "concentrated listening" (288) to serious music, by contrast, the "regression of listening" is about a rather casual, unconcentrated, absentminded or easy listening to popular music. When Adorno—a fan of avant-garde music composer Arnold Schönberg and his twelve-tone compositional technique—talks about popular light music, he means the technologically reproduced "mass music" (286) and its related "machinery of distribution" (287) causing a "decline of musical taste" (270). What Adorno called a decline in feel, experience or taste, Benjamin (1936 [1977]: 15) called famously and radically, as we will see later in a musical context, the "destruction" of "aura" through reproduction technologies.[29]

Both Adorno's and Benjamin's opinions on taste and aura provoked further debates. John Mowitt, an observer in cultural studies, states, "critical theory should not avoid the task of attempting to articulate the conditions of the restoration of aura" (1987: 190). Particularly in the "shift from mechanical to electronic reproduction" of sound, Mowitt sees a new form of "systematization of the fragment," referring to the previously impossible technological marvel of fragmentary editing music in its details, a process or technique that would assist the restoration of aura. Though I agree with Mowitt's reconsideration of aura in the face of a technological evolution from mechanical to electronic media, Mowitt's idea rests on the following language translation problem: Where the German title of Benjamin's Art Work essay reads "Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit" (the keyword here is "technischen," or technological), most English translations of his essay, including what Mowitt refers to, read "mechanical" reproduction. The German term "technisch" has a broad meaning, including mechanical and electronic reproduction. It implies a much larger context of technologies as compared to the term "mechanical," from which Mowitt embarks on the aura debate.[30]

Like Mowitt, cultural studies scholar Andrew Goodwin (1990: 221) also tries to revitalise Benjamin's aura debate for music in media today. Goodwin stresses that digital sound is "something new: the mass production of the aura." He reasons correctly that even “if the aura is now produced on a mass scale, this has not led to its demystification” (231). Aura is the “definition of the indefinable,” as cultural critic Marleen Stoessel (1983: 43) contends in a later detailed discussion on aura and musical telepresence.[31] In this discussion of aura, I generally agree with digital media scholars Jay David Bolter and Blair MacIntyre in their essay “New Media and the Permanent Crisis of Aura” (2006), which stresses that “what Benjamin identified was not the end of aura, but rather an ongoing crisis, in which the experience of aura is alternately called into question and reaffirmed” (22). As with Bolter and MacIntyre, I also agree with technology historian Hans-Joachim Braun (2002) saying, “compared with the beginning of the 20th century, reservations against the reproduction of music by audio media have nearly vanished today.” Braun sees the reasons for the vanishing—similar to Mowitt and Goodwin on aura—in “improvements in audio engineering” and the general “acceptance of electrification in all spheres of life” (25), leading also to the adoption of reproduced music.

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[29] Author's translation from German: "Zertrümmerung der Aura."

[30] Ironically, in his essay "The Task of the Translator," Benjamin (1923) himself detects such language barriers. Ludwig Wittgenstein (1921: 5.6) in his *Tractatus Logico-Philosophicus* would add "The limits of my language mean the limits of my world."

Here, or elsewhere in this thesis, I am not suggesting that there is no more mileage in Benjamin’s aura discussion. What I suggest is that certain positions on the technological reproduction of sound such as Pierre Schaeffer’s above-mentioned idea of “acousmatic listening” shed a constructive light on the subject of technologically mediated sound. His theory of acousmatic listening is significant because it puts forward a shift in the point of reference in the sensory perception of sound. To “deliberately forget,” as Schaeffer said earlier, “every reference to instrumental causes or preexisting musical significations”—that is acousmatic listening. In other words, Schaeffer does not assess the performance as original in Benjamin’s sense, but instead the sound medium, because it creates a new actuality—an acousmatic reality. To pursue this acousmatic reality on liveness and technological reproduction further with respect to distance music, we need to distinguish the situation of the audience and performers.

Conceptually, I distinguish in distance music what I call the audience/performer axis and the performer/performer axis. On the one hand, the *audience/performer axis* implies that the relationship between performers and audience changed through the invention and cultural diffusion of sound reproduction technologies. These historical developments began with telegraphy and telephony, as chapter 4 details, before the turn of the 20th century.[32] As Chanan (1995: 18) puts it, with sound reproduction "music has literally become disembodied." Sound reproduction removed the immediate physical proximity between musicians and listeners to establish instead a certain distance between them. In Sterne's words (2003: 309), recording was in fact "designed for ears distant in time and space, yet connected through the medium." Its cultural diffusion continues though radio, television, and the Internet. Sound reproduction thus enables music consumption in locations separate from music recording. Even if musicians deliberately perform music "for the medium itself" (Sterne 2003: 226) in the recording studio, they are always performing for an imagined audience. A purpose of recording, then, is that this imagined audience can reproduce the recording without the performer's physical presence. Therefore, it is useful to bear in mind these relationships between the performers and the audience when analysing transformations in musical performance and the technological reproduction of music.

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[31] Author’s translation from German: “Definition des Undefinierbaren.”

On the other hand, the *performer/performer axis* stresses that the performance situation between the musicians themselves has developed quite differently through sound reproduction, as compared to the relationship between audience and performers. Since the unknown origin of music, people gather to experience music together in the same physical location. No music technology has solved the problem of a lack of face-to-face interaction between musicians who are geographically separated. Neither musical notation, music printing, mechanical sound reproduction, nor multitrack recording have been able to do this. Of course, the multitrack approach makes possible a geographically distributed and successive recording of the individual parts or fragments of a song. But it diminishes musicians' abilities to perform together in real time beyond the walls of a shared recording studio.[33] Therefore, it is necessary to distinguish the performer/performer axis from the audience/performer axis. This is also because the spatiotemporal relationships of each of the groups involved developed in a different way historically, given the context of different sound technological innovations. Since Edison, sound recording mostly transformed the spatiotemporal situation of an audience, whereas electronic networks can also transform that of the performers.

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[32] See Evan Eisenberg (2005) *The Recording Angel: Music, Records and Culture from Aristotle to Zappa*, Yale University Press, New Haven and London. Also Sterne (2003), Kittler (1986), Katz (2004), Brock-Nannestad (2009: 149-77), Schneider (2009: 31-49).

[33] Timothy Warner (2003) writes on multitrack recording in "The Production of Pop Music" (18-38) in *Pop Music—Technology and Creativity—Trevor Horn and the Digital Revolution*, Ashgate Publishing, Aldershot, United Kingdom.

2.1.2. Musical Telepresence and Aura

Computer scientists John Lazzaro and John Wawrzynek (2001) explain the situation of network musical performance in this way: it occurs "when musicians in different locations interact over the Internet, to perform as they would if located in the same room" (157). Geographically distributed performers involved in such musical practice are thus no longer restricted to a shared acoustic space besides the computer networks.[34] However, what appears to be ubiquitously available to musicians on the Internet is in fact highly restricted and unavailable to most of them. Chapter 5 makes the case that only a small minority of the world's musicians has any access to effective performance networks. Most musicians still face large amounts of network delay, causing audio and video synchronisation problems when trying to perform at a distance.[35]

A turn of phrase similar to "network musical performance" is that of "musical telepresence."[36] It means that in some distributed performance environments, musicians hear each other and also see the remote site on screen.[37] In *Understanding Virtual Reality* (2003), William Sherman and Alan Craig explain telepresence: "'Tele' means distant and 'presence' is the state of being present or here." Telepresence refers to the "physical world as opposed to representing a world that is entirely computer generated" such as in pure virtual reality (20). Instead, unmanned, remotely operated military robots, drones, scout cars, aerospace engineering, and medicine use high-end telepresence technologies. Engineers Alexander Sawchuk and Elaine Chew (2003) in their Distributed Immersive Performance project at the University of Southern California, express their idea of musical telepresence as follows: It is about a "complete aural and visual ambience that places a person or a group of people in a virtual space where they can experience events occurring at a remote site or communicate naturally regardless of their location" (110).

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[34] A technological account of computer networks provide Andrew S. Tanenbaum and David J. Wetherall (2011) *Computer Networks*, 5th Edition, Pearson Education, Boston, Massachusetts.

[35] Alexander Carôt and Christian Werner (2009) "Fundamentals and Principles of Musical Telepresence," in *CITAR Journal of Science and Technology of the Arts*, vol. 1, iss. 1, pp. 26-38. Also, Carôt (2009), Tanaka (2006: 272).

[36] There exist different network music terminologies. Building on terminologies in distance education, Jordà/Barbosa (2001) use "computer supported collaborative music" and Barbosa (2006) "computer-supported cooperative work for music applications." Payne (2007) uses "telematic music." Other uses include "real-time collective composition on the Internet," "distributed musical rehearsals," "computer supported cooperative music," "real-time jam sessions," "real-time web jamming," "real-time jamming over the Internet" or "real-time music jamming via the Web." See also Renaud/Carôt (2007: 1), Hajdu (2007: 41), Kurtisi/Xiaoyuan (2006: 52), Carôt (2004: 4), Bryan-Kinns (2004), Bryan-Kinns/Healey (2004).

[37] On the significance of bilateral audiovisual communication in musical telepresence, see Chrisoula Alexandraki and Ioannis Kalantzis (2007) "Requirements and Application Scenarios in the Context of Network Based Music Collaboration" (39-47), in *Proceedings of 3rd International Conference on Automated Production of Cross Media Content for Multi-channel Distribution*, eds. Jaime Delgado and Kia Ng, Firenze University Press, Italy. See also Alexandraki/Akoumanakis (2010).

Yet as regards terminology, musical telepresence overlaps other virtual reality-related concepts such as augmented reality. Augmented reality means that a "physical reality is here (proximal)," whereas telepresence means that a "physical reality is there (distal)" (Scherman/Craig 2003: 22). For example, soldiers can operate an unmanned military robot in telepresence "there" in the distance. Paradoxically, opposed to Scherman and Craig's version of telepresence, musical telepresence seems to involve both the "proximal" and the "distal," given the co-presence among spatially distributed performers. Musical telepresence, then, characterises a combination of augmented reality and telepresence. Suppose musical performers interact as virtual avatars in computer-generated environments like Second Life; then there would only be one virtual performance space. Musical telepresence, however, involves at least two physical spaces where the performers play.

Like any other musical performer, those in musical telepresence may experience the sensation of aura. However, in regards to media theory, the use of the term "aura" heavily draws on Walter Benjamin's influential ideas on technological reproduction. In what follows, I will show where Benjamin got the idea of aura, and how he employs it. The point is to relate Benjamin's idea of aura to the subject of musical telepresence. In doing so, first, we should address the fundamental question, "what is aura?" Benjamin posed this question in his essay on a "Short History of Photography" (1931 [1977]) where he answers—as we will come back to later in the discussion—that aura is "a strange weave of space and time: a unique appearance of distance, no matter how close it may be" (57). He also explains how one could "breathe" the aura of nature: "While resting at midday in summer to trace a mountain range on the horizon or a branch that casts a shadow on the observer, until the moment or the hour becomes part of their appearance—this is what it means to breathe the aura of those mountains and that branch" (id.).[38]

Many interpretations seek to explain what Benjamin supposedly meant with the above passages on aura. Yet its meaning has remained unclear. Instead, what the various takes on the subject show, are more the interpretative problems of Benjamin's aura than clarifying it. Its ambiguity generates ample space for different meanings to breathe. Scholars stress, for example, that Benjamin means the term "breathing" in Hölderlin and Goethe's sense of breathing (van Reijen 2001: 31). Others emphasise "aura begins with smell," since in "Greek and Latin [aura] signifies air and breath" (Geller 1997: 207) or as Marleen Stoessel (1983: 11) earlier identified it as the "definition of the indefinable." Aura has different meanings outside media theory. In medicine, aura characterises a sensory perception heralding an "epileptic shock" (Claußen 2009: 58). However, before relating aura to musical telepresence, we should consider a passage on aura from Benjamin's (1972: 106-7) hashish and morphine experiments, conducted between 1927-1938. In his protocols of these experiments, Benjamin clarifies three key features of what he sees as the "authentic aura:"

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[38] Author's translation from German: "Was ist eigentlich Aura? Ein sonderbares Gespinst von Raum und Zeit: einmalige Erscheinung einer Ferne, so nah sie sein mag. An einerm Sommermittag ruhend einem Gebirgszug am Horizont oder einem Zweig folgen, der seinen Schatten auf den Betrachter wirft, bis der Augenblick oder die Stunde Teil an ihrer Erscheinung hat—das heißt die Aura dieser Berge, dieses Zweiges atmen."

> Everything that I said there had a polemical edge against the Theosophists whose inexperience and ignorance were highly offensive to me. And I put the authentic aura in contrast to the conventional banal beliefs of Theosophy—even if indeed not schematically—in three regards. First, the authentic aura appears in all things. Not only on certain ones as people imagine. Second, the aura changes completely from ground up with every move of the thing possessing that aura. Third, the authentic aura can in no way be thought of as the spiritualistic ray magic, as the vulgar mystical books depict and describe it. Instead, the characteristic feature of the authentic aura is: the ornament, an ornamental encirclement in which the thing or being is deeply immersed, as in a sea shell. Perhaps nothing provides a more appropriate expression of the authentic aura as van Gogh's late paintings in which for all things—that is how one could describe these paintings—the aura has been painted along with the object.[39]

This protocol reveals that Benjamin himself got the idea of aura from, as Bolter and MacIntyre (2006) state, the "theosophical and Jewish mystical traditions of the 19th century" (26). It also reveals how radically Benjamin demarcated and tailored his version of the idea of aura for his own philosophical enterprise.[40] The inventor's point is now that aura can appear on *all* beings *and* objects and that aura itself is dynamic and subject to change. Ironically, Benjamin criticises "spiritual ray magic" but later reincarnates this as the "ornamental encirclement," which likewise represents a "mystical" or maybe even a "banal idea" of the Theosophists that Benjamin so criticised.

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[39] Author's translation from German: "Alles, was ich da sagte, hatte eine polemische Spitze gegen die Theosophen, deren Unerfahrenheit und Unwissenheit mir höchst anstößig war. Und ich stellte—wenn auch gewiß nicht schematisch—in dreierlei Hinsicht die echte Aura in Gegensatz zu den konventionellen banalen Vorstellungen der Theosophie. Erstens erscheint die echte Aura an allen Dingen. Nicht nur an bestimmten, wie sich die Leute einbilden. Zweitens ändert sich die Aura durchaus und von Grund auf mit jeder Bewegung, die das Ding macht, dessen Aura sie ist. Drittens kann die echte Aura auf keine Weise als der spiritualistische Strahlenzauber gedacht werden, als den die vulgären mystischen Bücher sie abbilden und beschreiben. Vielmehr ist das Auszeichnende der echten Aura: das Ornament, eine ornamentale Umzirkelung in der das Ding oder Wesen fest wie in einem Futteral eingesenkt liegt. Nichts gibt vielleicht von der echten Aura einen so richtigen Begriff wie die späten Bilder van Gogh's, wo an allen Dingen—so könnte man diese Bilder beschreiben—die Aura mit gemalt ist." For a different translation see Benjamin's (2006: 58) *On Hashish*.

Benjamin's above protocol explains the experience of aura as a state of intensive, concerted perception or a state of deep immersion in something. This is the point in the discussion where the subject of musical telepresence comes into play. Regarding the concept of telepresence without music, Bolter and MacIntyre (2006) suggest that the general concept of telepresence and Benjamin's concept of aura are incompatible. In contrast to Benjamin, Bolter and MacIntyre recognise telepresence as a "sense of proximity no matter how far the subject really is from the physical location" (28). Conversely, Benjamin further above argued that aura is a "unique appearance of distance, no matter how close it may be." It is correct to suggest that also a musical telepresence can evoke a sense of proximity, no matter how far the distance among distributed performers. Benjamin's concept of aura and that of musical telepresence, in a sense, are compatible, for telepresent performers also may have a unique experience of distance no matter how close it may appear on a video screen. Let us take a closer look at Benjamin's concept of aura and how it relates to the experience of musical telepresence, portrayed in three stages.

First, musical telepresence is a unique sonic experience because the performers' interaction occurs as with a traditional performance only once in immediacy—all sounds disappear right away. Unlike a sound recording, musical telepresence succumbs less to the idea of mass distribution in the materialistic sense of gramophone music. Instead, each performance in musical telepresence is genuine, inimitable, sounding and feeling always slightly different in its details. It has its own touch and performance qualities if not, to borrow from Benjamin (1977: 16-8), its own "cult values." With musical telepresence, the cult value of acoustic art will less likely disappear for the benefit of, Benjamin puts, an "exhibition value" with strong capitalistic, commercial values of mass-materialised and distributed music. With the distinctive nature of musical telepresence there will probably emerge entirely new rituals and performance traditions that we may call new telecult values.

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[40] See furthermore Josef Fürnkäs (2000) chapter "Aura" (95-146), in *Benjamins Begriffe*, eds. Michael Opitz and Erdmut Wizisla, Suhrkamp Verlag, Frankfurt am Main. Also Claußen (2009: 56-61), Schütte (2006: 259-84).

Second, the middle part of Benjamin's aforementioned aura definition of "distance"—as applied to musical telepresence—may also refer to certain ritual performance traditions. Some of these may even involve a form of adoration possibly for a prominent co-performer on the other side of the network. Musical adoration may cause a certain subjective experience of awe or disconcertment in another performer. Also, certain rituals in musical telepresence may perhaps evoke a certain feeling of distance between one performer and another famous and adored performer. Finally, the last section of Benjamin's aura definition, "no matter how close it may be" can also be an emotion of a certain closeness among performers in musical telepresence. Alternatively, the section may also relate to a virtual proximity among performers in telepresence, given that video screens often stand nearby within a few metres of the performers in each site.

Benjamin (1977) understands aura as inseparable from what he calls the "here and now" (12). Following this thought, music may have a surrounding aura only when the music appears in one particular space and time as opposed to simultaneously elsewhere. Yet networked performers in video-based telepresence appear simultaneously on screen in different spaces. Does this mean they are deprived of experiencing aura? Artist and music technology scholar Atau Tanaka writing on musical telepresence in his chapter "Interaction, Experience and the Future of Music" (2006) helps us understand. "If music is made on networks," he reasons, then "the network infrastructure becomes the space the music occupies" (278). Even though it is difficult to imagine music itself in the space of electronic networks, these spaces create musical reality. Regarding the temporal aspect of network music, Tanaka continues that the "time characteristic of that [network] infrastructure defines the musical quality of that medium. Network transmission latency thus becomes the acoustic of the network." In other words, in musical telepresence, networks represent the here and now.

Experiencing the aura of musical telepresence is as individual as "breathing" the aura of a painting. Aura, as theologian Susanne Claußen (2009) properly concludes, lies "beyond empirical verification and philosophical reflection. It is a purely individual experience that cannot be questioned" (60).[41] Like observers of a

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[41] Author's translation from German: "entzieht sich empirischer Überprüfung und philosophischer Reflexion. Auch sie ist als rein individuelle Erfahrung nicht hinterfragbar und damit keine wissenschaftliche Kategorie."

Vincent van Gogh painting, telemusicians playing at a distance may feel, to use Benjamin's own words, "deeply immersed" in their performance. What Benjamin sees in the experience of aura as a "unique appearance of distance, no matter how close it may be," others may experience as a breath of 'musical teleaura'—brought about through a change in the human perception in technologically reproduced music.[42]

2.1.3. Rethinking Live and Reproduced Music

The increasingly blurred lines between live and technologically reproduced music fascinate cultural theorist Jody Berland (2008), for "recordings simulate live recordings, which in turn simulate live performance" (33). At first sight, Berland's wordplay sounds right, but then it reveals a problem: a sound recording cannot simulate a live performance as a recorded performance has usually been performed live to record it.[43] It ultimately acts as preservation of the sound, rather than simulation. The occurrence of sound already implies some kind of performance, as sound would not come into being without it. What a live recording can simulate is an applauding audience—never the musical performance itself. If musicians can record a live performance, it can also be performed live, as DJ cultures prove.[44] DJs perform live using recorded music, and music performers can play live to recorded music. Variations on this scenario may involve a half-playback situation, that is, when a band performs live and a recording plays back the singer's vocals or vice versa, the band on recording and the voice live. In distance music—whether half-playback or live—the entire musical performance is technologically reproduced through the transmission medium.

Non-mediated occurrences of music seem rare, if possible at all. This is true considering that music can only occur while somebody or something produces sound waves mediated to an ear through the air. However, what live and recorded musical occurences characteristically share is a similar realm of social interactions both in Philip Tagg's (2002) sense of a "definition of music" as "humanly organised" sound through "interhuman communication" (3), as well as to reinforce Sterne's (2003) concept that also "sound reproduction is a social process" (219). In the light of Tagg's and Sterne's ideas, it makes sense when performance studies scholar Philip Auslander emphasises in *Liveness, Mediatization, and Intermedial Performance* (2000) that musical performances of live and recorded music do not necessarily belong to "different realms" (1).[45] Both live and recorded performances have common social roots. To bring these roots to light, I suggest the following three ideal-typical modes of direct, distributed, and imagined musical interactions.

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[42] See Frank Cox's (2006) related chapter "Aura and Electronic Music" (52-66), in *Electronics in New Music*, eds. Claus-Steffen Mahnkopf and Frank Cox, Wolke Verlag, Hofheim, Germany. The journal *Transformations*, issue 15, 2007, is dedicated to "Walter Benjamin and the Virtual: Politics, Art, and Mediation in the Age of Global Culture."

[43] A technical and practice-oriented account on live recording provide Bruce Barlett and Jenny Barlett (2007) in *Recording Music on Location: Capturing the Live Performance*, Elsevier, Burlington, Massachusetts and Oxford, United Kingdom.

[44] See Ulf Poschardt's (1997) *DJ-Culture*, Rowohlt, Reinbeck, Germany.

Direct musical interactions occur when musicians perform face-to-face in the same physical location and at the same time. This mode of interaction implies the rather traditional—and well-researched—types of musical performance already addressed above.[46] As a second suggestion, *distributed* musical interactions occur in musical telepresence. The musicians are neither directly nor indirectly interacting with one another, but instead electronic networks mediate their interactions at a distance. Hence, they do not experience their performance face-to-face; they experience it audiovisually on screen and through loudspeakers as if all performers were located in the same room. *Distributed* musical interactions can be further divided into the following approaches: In their essay "Fundamentals and Principles of Musical Telepresence" (2009), engineers Alexander Carôt and Christian Werner identify these as the "realistic interaction approach," the "master-slave approach," the "laid back approach" as well as the "delayed feedback approach" (33-6). What Carôt and Werner express are different approaches to "real-time" interaction among distributed performers within conditions of latency or network transmission delay (see "Glitches of Distance Music" in chapter 5).

Imagined musical interactions may occur when musicians perform on their own with musical technologies that provide prerecorded sound data. Here, an indirect interaction occurs because the medium cannot directly respond; instead, the performer may imagine another person playing the music. Consider what the modern American drummer Donny Gruendler, a trained Jazz musician, has to say about his pop musical practices fusing technologically reproduced sounds. *Drummerworld.com* describes,

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[45] See also Philip Auslander (2006) "Music as Performance: Living in the Immaterial World," in *Theatre Survey*, vol. 47, iss. 2, pp. 261-9.

[46] On musical performance, Godlovitch (1998) and Sharpe (2000: 126-58).

> Once Gruendler has dissected a track, he's ready to jam. The drummer uses a 10-pad DrumKat [electronic percussion pad] to select and trigger samples and licks while he's playing. "When I'm on stage, I feel like the tracks are someone I'm having a duet with," he says. "Sometimes electronic music producers don't think that samples and loops can adapt to a live situation. I have an improv[isation] background. I don't think of the parts as rigid dance beats. I bring the loops in and out of the performance in real time. I can pick through them and I'm not thinking of them as fixed things. The computer is just another live instrument to me."[47]

In other words, one could say that when Gruendler plays the drums in "duet with" technologically reproduced sounds, he imagines interacting with another musician face-to-face. Imagined musical interactions may also occur using all types of technologically reproduced sounds—whether these are of purely synthetic nature from software synthesisers, are prerecorded sounds on commercial sample libraries, or are prerecorded sounds exchanged among band members. Even if these musicians are not directly interacting face-to-face or in musical telepresence, a subtler mode of musical interaction occurs, hence the term "imagined." Imagined musical interactions are truly boundless. They may also include relations between engineers and musicians. Engineers who create music technologies (such as virtual musical instruments and studios detailed in chapter 5) may need to imagine the musicians who will interact with them. On the other hand, the musicians may well imagine the engineers with whose ideas they are interacting. As neither side of the performers directly interacts with the other, the performers indirectly interact by imagining one another.

These three modes of social musical interactions are not mutually exclusive, but rather involve each other and overlap in actual musical practice. My point in the discussion of live and reproduced music, is that we might better understand the notion of live music this way: that living performers create music regardless of whether or not it is technologically mediated; their actions are based on at least one of the suggested modes of social musical interaction. Thus, the notions of live and reproduced sound are not contradictory, but accompany direct, distributed, and imagined musical interactions. To expand upon the idea of transformation in music and technology, I will now discuss different concepts on the origins and effects of music technologies, starting, fundamentally, with the cybernetic concept of

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[47] Bernhard Castiglioni (2012) "Pro in the Studio: Donny Gruendler," available at http://www.drummerworld.com/drummers/Donny_Gruendler.html (April 2012).

"difference." It is about transformation made quantifiable through a given "input" and "output."

2.2. Input and Output

Difference

In his influential work *An Introduction to Cybernetics* (1956), physician W. Ross Ashby delineates a concept that he calls "difference."[48] Ashby makes the point that when we deal with transformation or "change" of some sort we actually deal with difference. Difference occurs then when either "two things are recognisably different" or "one thing has changed with time" such as "when plants grow and planets age and machines move some change from one state to another" (9). To explain change conceptually, Ashby uses the terms "operand" and "operator." While the operand names an entity that is acted upon or influenced by something, in turn, the operator names that entity that acts on something. The result or output into which the operator has changed the operand Ashby calls the "transform," and the whole procedure of change is the "transition" (10).

For the sake of clarity, let us see if we can apply Ashby's concept of difference to Gregor's aforementioned human-to-animal change in Kafka's "The Metamorphosis." Gregor would be the "operand," whereas his traumatic or mysterious night would be the "operator" that changes him into a vermin, hence the "transform." In conceptual terms, Gregor's transition would read in this way: Gregor → Vermin, or G → V. Ashby points out that a "transformation" occurs only in the case where one operator acts upon several operands and so causes a series of single transitions, which would be the case if we were to consider how the whole Samsa family changes because of Gregor. Besides various other types of transformations that Ashby discusses, including "closed transformations," "identical transformations" and "repeated change" (11-6), he makes the case where he calls the operator "exposure to sunshine" (10). It consists of the following set of transitions:

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[48] Ashby (1956) is known for his so-called law of "requisite variety"—that only variety can absorb variety (202-19).

Cold soil → Warm soil
Unexposed photographic plate → Exposed plate
Coloured pigment → Bleached pigment.

We can relate Ashby's case of transformation to digital music. Even if his ideas on transformation are mostly scientific and not directly concerned with music-in-media theory, they could also demonstrate transformations in music and technology. For example, the operator "digitisation" may involve the following set of transitions:[49]

Analogue-supported music production → Digital-supported music production
Analogue music distribution → Digital music distribution
Analogue music consumption → Digital music consumption

Were we to analyse analogue-to-digital transformations in music and media strictly according to Ashby's idea of transformation, then complex mathematical issues of continuous changes would emerge. Even though relevant, let us momentarily put aside the mathematical approach and instead revisit Kafka's earlier passage on musical performance in view of Ashby's idea. Suppose that Gregor's sister would electrically amplify the sound of her violin by microphone and loudspeaker—here an acoustic-to-electric transformation of sound would occur. Ashby's "operands" are the acoustic sound waves that Gregor's sister produces with her violin; in turn, the "operator," acting upon these acoustic sound waves, is the microphone. Since this acoustic-to-electric transformation of sound would require complex continuous changes difficult to express, a simplified conceptual understanding of it in Ashby's sense would be this: Acoustic sound waves → Electric waveform, or A → E. Though at first this example may seem insignificant, it hints at a deep-seated principle in today's music—that of *sound transduction*. All electroacoustic music—that is almost all music today—functions on the premise of sound transduction.[50] In the following passage, Ashby (1956: 46) explains the basic function of a transducer as a relationship between an "input" and "output:"

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[49] On digital transitions in the value chain of the New Zealand music industry, see Nicholas William Mabey (2006) *On the New Zealand Music Industry*, Master Degree, School of Geography and Environmental Science, University of Auckland. Generally, Yúdice (2007), Burkart/McCourt (2004, 2006: 17-43), Burkart (2005, 2009, 2010), McCourt/Burkart (2003), Burkart/Westgate (2009), Dolfsma (2000), Hesmondhalgh (2002, 2006), Jones (2002), Bustamante (2004), Haug/Weber (2002), Hess (2003), Kaiser/Ringlstetter (2008), Kämmer (1988), Leyshon/Webb (2005), Christianen (1995), Burnett (1996: 44-64).

[50] Veit (1988: 87), Webers (1985: 138), Dickreiter (1987: 143-5), Albrecht (1995), Brüderlin (1978: 108-10), Rieländer (1982: 434-5), Graber (2000: 89-90), and Conrad (2001: 109) offer a technological analysis of sound transduction.

> The word 'transducer' is used by the physicist, and especially by the electrical engineer to describe any determinate physical system that has certain defined places of input, [by] which the experimenter may enforce changes that affect its behaviour, and certain defined places of output, at which he observes changes of certain variables, either directly or through suitable instruments.

In music making, transducers are needed to transform and retransform sound. A first transformation occurs when a sound receiver, say, a microphone takes in acoustic sound waves from the air and transforms these into electrical signals.[51] They flow through cables and, as Les Paul (1979) noted earlier, "all those funny boxes hooked in between the guitar and the amplifier" until a loudspeaker retransforms the electrical signals back into acoustic sound waves, which are finally transformed by the human auditory system into musical reality. Supposed Gregor's sister in Kafka's "The Metamorphosis" were to perform her violin on the Internet along with a distant performer on piano. Then, in Sterne's (2003) words, an analogue-to-digital transducer would "add another level of transformation converting electrical current into a series of zeros and ones (and back again)" (22). An analogue-to-digital transduction means "sampling," that is, according to music technology scholar Curtis Roads in *The Computer Music Tutorial* (1996), "converting continuous analog signals (such as those from a microphone) into discrete time-sampled signals" (9-10).[52]

From a perspective of music in media, Ashby's cybernetic concept of "difference" is relevant because most musical practices today involve transformations of sound from one mode into different modes of energy. Transformation makes possible the storage and transmission of sound using different types of media. Yet the deeper, underlying causes of transformation in musical practices transcend Ashby's mathematically quantifiable account to a broader discussion on sociocultural configurations of society.[53] Take, for example, the popular transition from CD to MP3 in the 1990s. Years of arduous research preceded the known scientific outcome of a functioning audio compression algorithm. Clusters of researchers, including engineers at the University Erlangen-Nürnberg in Germany, worked at developing these algorithms since the early 1970s.[54] Universities are societies' brains, financed by the public and controlled by critical groups of people in politics, economics, and culture. While MP3 is surely the researchers' work of art, at the same time, it eventually came to belong to the whole society. Ashby's account does not seem to address that technologies such as MP3 itself represent social artifacts with a considerable history of development. Let us look at how the following sociological concept of "mediamorphoses" discusses the subject of transformation in a music and technology context.

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[51] On the cultural meaning of the microphone, Donald Greig (2009) "Performing for (and against) the microphone" (16-29), in *The Cambridge Companion to Recorded Music*, eds. Nicholas Cook and Eric Clarke, Cambridge University Press, Cambridge and New York. On the microphone as musical instruments, Chanan (1995: 69).

[52] Music-in-media scholar Julian Henriques (2003) notes sound transduction in "Sonic Dominance and the Reggae Sound System" (451-80), in *The Auditory Culture Reader*, eds. Michael Bull and Les Back, Berg Publishers, Oxford.

[53] See cultural sociologist Richard Peterson (1982) "Five Constraints on the Production of Culture: Law, Technology, Market, Organizational Structure and Occupational Careers," *Journal of Popular Culture*, vol. 16, iss. 2, pp. 143-76.

2.2.1. Output: Effects of Music Technologies

Mediamorphoses of Music

Sociologist of music Kurt Blaukopf uses the term "mediamorphoses" (singular: mediamorphosis) to include the terms "media" and "metamorphosis/es." Blaukopf's idea of mediamorphoses apparently draws on the biological idea of transformations from one mode of being into another in distinct morphs or phases—similar to Gregor's human-to-animal transformation in Kafka's "The Metamorphosis." What Blaukopf in his essay "Westernisation, Modernisation, and the Mediamorphosis of Music" (1989) calls the "electronic mediamorphosis" means "changes in patterns of musical behaviour" through the "electronic mutation of musical communication." The electronic mediamorphosis of music sheds light on the "impact of the electronic media"—like the telephone in chapter 4—"upon the creation of music and upon the technical and economic mechanisms governing the dissemination of music" (183). And in music making, the electronic mediamorphosis considers "the status of the composer, [and] the role and status of the performers" (184).[55]

In his book *Mediamorphoses of Cultural Production: Art and Communication Technologies in Transformation* (2002), Blaukopf's former research assistant Alfred Smudits expanded the idea of the electronic mediamorphosis from its primary focus on music, to a larger historical framework of various mediamorphoses in cultural production.[56] Smudits' idea starts from the premise—what he calls the "productivity theory of media"—that a society's cultural output always relates to its state of technological development (73-90). In this sense, mediamorphoses in cultural production "cover the whole field of cultural communication. If new communication technologies enter the picture, then also the conditions of production, distribution and perception change" (91).[57] As graphically outlined further below in Figure 5, Smudits (2002) suggests four, or more specifically, five key historical phases or morphs of cultural transformation in music.

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[54] On the historical development of mp3 from the 1970s until 2009, see Fraunhofer-Institut für Integrierte Schaltungen IIS (2009) "Die mp3 Geschichte," available at http://www.mp3-geschichte.de/de/zeitleiste0.html (April 2012). Also, Jonathan Sterne (2012) *MP3: The Meaning of a Format*, Duke University Press, Durham and London.

[55] On the electronic mediamorphosis, also Kurt Blaukopf (1989) *Beethovens Erben in der Mediamorphose: Kultur- und Medienpolitik für die elektronische Ära*, Arthur Niggli Verlag, Heiden, Switzerland.

First, the *written* mediamorphosis identifies early developments of written symbols such as cave painting and later musical notation starting around the 12th century. Second, the *graphical* mediamorphosis is about the Gutenberg era and the emergence of a larger writing and reading culture beginning near the end of the Middle Ages, that is, the end of the 15th century. It involves the surfacing of a music printing and publishing business entailing new employment and career opportunities for musicians, as well as other music-related cultural, economic, and legal transformations. Third, the *chemical-mechanical* mediamorphosis considers the invention of photography and film and in music the development of sound reproduction, including the related emergence of a music industry. Fourth, the earlier-mentioned *electronic* mediamorphosis—which Smudits, together with the chemical-mechanical mediamorphosis in Figure 5 below—analyses music cultural transformations in music caused mainly by the sound transmission media of radio, film, and television. By contrast, telephony plays a surprisingly minor role in electronic mediamorphosis. Finally, the *digital* mediamorphosis represents an extension of electronic developments, and thus examines transformations caused by digitisation in contemporary music culture. Sociologist of music Regina Sperlich (Smudits' former research assistant) uses the concept in her book *Popular Music in the Digital Mediamorphosis* (2007) to empirically examine transformations in the production, distribution, and consumption of the Austrian music industry.[58]

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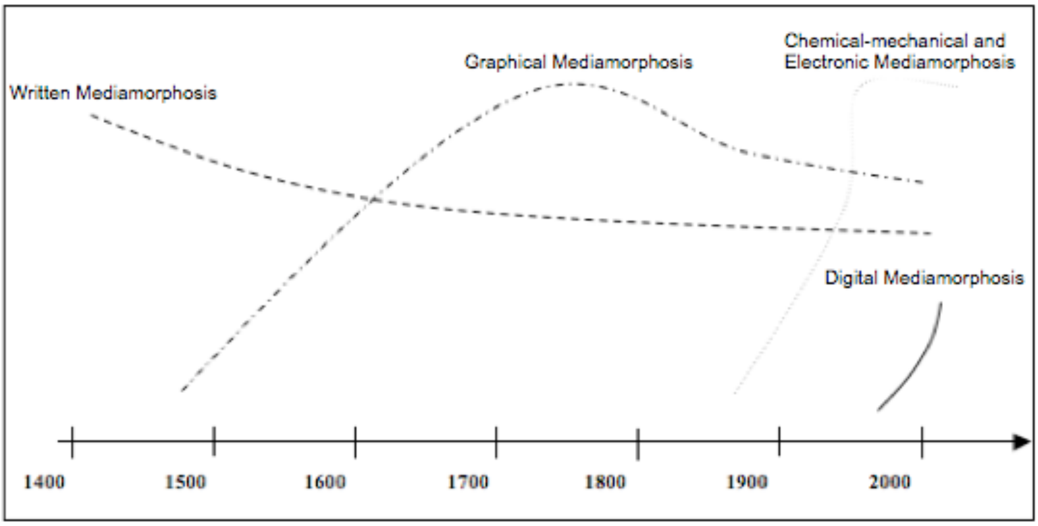
[56] Author's translation of Smudits' German book title: *Mediamorphosen des Kulturschaffens: Kunst und Kommunikationstechnologien im Wandel.*

[57] Author's translation from German: "Mediamorphosen umfassen den gesamten Bereich der kulturellen Kommunikation. Wenn neue Kommunikationstechnologien auf den Plan treten, verändern sich sowohl Produktions-, wie Distributions- und Rezeptionsbedingungen."

[58] Author's translation of Sperlich's German book title: *Popularmusik in der digitalen Mediamorphose*.



[Fig. 5] Historical succession of mediamorphoses of music.[59]

The theory of mediamorphoses illustrates historical transformations in the production, distribution, and consumption of music since the beginning of writing. However, with such a broad historical framework of analysis there is a danger in too holistically overlooking the rather atomistic transformations that each of the historical mediamorphoses contains. For instance, today the lines among the traditional systems of production, distribution, and consumption are heavily blurring in music through the massive use of digital music technologies and the Internet, powered somewhat by the users themselves instead of the music industry alone. Smudits and Sperlich's mediamorphosis of digital music tends to overlook this young and dynamic productivist impulse of the contemporary music culture. Instead it clings to the Marxist-inspired models in critical theory and industrial and organisational sociology, analysing cultural production as an aspect of macro-capitalist market systems.[60]

Another case of the new productivist impulse in music culture would be musical telepresence. Performers in telepresence produce sound while distributing and consuming it. Performers can do so nearly at the same time in their own little, what electronic music scholar Simon Waters (2007: 4) calls, "performance ecosystem," as opposed to that system of the music industry. Of course, distributed music making is also a form of productive activity; I am not suggesting that it is not. I am referring to a lack of the new productivist impulse in studies of sound culture, the mediamorphoses of music, and its earlier-mentioned “productivity theory of media.” As stated before, mediamorphoses deal with large-scale cultural transformations, and sometimes overlook smaller transformations in music and media. For example, Sperlich (2007: 18) argues that musicians would rarely use the Internet to “produce” music if only in the sense of sending files back and forth (a point that the interviewees in chapter 5 will discuss differently). Though mediamorphoses of music is a useful historical and theoretical concept, it tends to overlook the recent subject matter of distance music.

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[59] Author's drawing based on Smudits (2002: 204).

[60] Similar to the theory of mediamorphosis is Robert Burnett's (1996: 64-99) theory on the "production" and "consumption" of popular music; it draws on industrial and organisational sociology including Peterson (1982). See also Huygens et al. (2001).

Earlier I noted that mediamorphoses evolved as a concept from Blaukopf’s initial focus on music and technology to Smudits’ larger version of mediamorphoses of cultural production. It is noteworthy that both of their ideas provide heavy technology-or media-centric positions. Mediamorphoses holistically stresses the impact of a given technology in a given historical time on music cultural life as a cause-and-effect relationship. It is a relationship that Raymond Williams in “The Technology and the Society” (1972) questions—in reply to Marshall McLuhan’s technology-deterministic views—if it would be “reasonable to describe any technology as a cause.” Williams’ idea is that studies of “effects” should find much wider cause and effect relationships “between a technology and a society, a technology and a culture, a technology and a psychology” (27) rather than the technology alone. Even if the theory of mediamorphoses somewhat agrees with Williams’ point, there does resonate a strong top-down expectation in mediamorphoses’ assertion on the relationship between music and technology.

Mediamorphosis of Digital Media

Blaukopf and Smudits’ theory of mediamorphoses stresses the effects of technologies on music. By contrast, media theorist Roger Fidler’s (1997) concept of “mediamorphosis” centres on transformations in digital media. Fidler’s concept does not end in critical theory like mediamorphoses of music, but instead in systems theory, concepts of convergence, and media diffusion theory.[61] He defines the mediamorphosis of digital media as “transformation of communication media, usually brought about by the complex interplay of perceived needs, competitive and political pressures, and social and technological innovations" (22). He radically argues that the "established forms of communication media must change in response to the emergence of a new medium—their only other option is to die" (23). Fundamental to Fidler's reasoning are the following six "principles of mediamorphosis:"

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[61] See also Peter R. Monge and Noshir S. Contractor (2003) *Theories of Communication Networks*, Oxford University Press, New York.

1. *Coevolution and coexistence:* All forms of communication media coexist and coevolve within an expanding, complex, and adaptive system. As each new form emerges and develops, it influences, over time and to varying degrees, the development of every other existing form;
2. *Metamorphosis:* New media do not arise spontaneously and independently—they emerge gradually from the metamorphosis of older media. When newer forms emerge, the older forms tend to adapt and continue to evolve rather than die;
3. *Propagation:* Emerging forms of communication media propagate dominant traits from earlier forms. These traits are then passed on and spread through communicatory codes called languages;
4. *Survival:* All forms of communication media, as well as media enterprises, are compelled to adapt and evolve for survival in a changing environment. Their only other option is to die;
5. *Opportunity and need:* New media are not widely adopted on the merits of a technology alone. There must always be an opportunity, as well as a motivating social, political, and/or economic reason for a new media technology to be developed;
6. *Delayed adoption:* New media technologies always take longer than expected to become commercial successes. They tend to require at least one human generation (20 - 30 years) to progress from proof of concept to widespread adoption (29).

Fidler's principles of mediamorphosis offer practical tools to examine the field of distance music. "Coevolution and coexistence" could, for example, shed light on how specific telepresence applications grow within larger frameworks of music and media technologies (see chapter 5). "Propagation" could study today's emerging telepresence media, since these propagate "dominant traits from earlier forms" of communication media, especially the telephone. Telephony is revived in newer forms of media and its practices of skyping, videoconferencing, and distance education, for example. Jay David Bolter and Richard Grusin (1999: 20-64) would call propagation instead "remediation." Remediation identifies how newer forms of media like the Internet often propagate older forms of media. An example would be the old idea of telephony reappearing in the modern computer (Skype); as Kittler once said, computers collect and fuse older forms of media into one universal medium.[62] In McLuhan's (2002) sense, remediation also reflects the idea that the "'content' of any medium is always another medium" (18). However, remediation also relates to Fidler's principle of "metamorphosis" for telephony "didn't die," but adapted to changing media environments. Conversely, the disappearance of telephone music is related to Fidler's principle of "survival" because the media enterprises of telephone music did not "adapt and evolve for survival in a changing environment." That is why they "died" when radio took over in the 20th century.

Whereas Fidler's principles of mediamorphosis analyse the emergence and diffusion of digital technologies, Blaukopf and Smudits' theory of mediamorphoses analyses the effects of technologies on culture. Fidler (1997: 53-80) detects only three main historical mediamorphoses, that is, speech, writing, and digital technologies. Blaukopf and Smudits detect, by contrast as outlined above, five historical mediamorphoses, including (what Fidler neglects) mechanical and electronic developments as separate mediamorphoses. Electronic developments are crucial in music history. Inventor and pianist Thaddeus Cahill played on his Telharmonium the first synthesiser music to a New York telephone audience around the turn of the 20th century; before that, companies had already transmitted live musical performances to distant audiences based on the electronic innovation of the telephone (see chapter 4).

Fidler historically dates the arrival of the digital mediamorphosis as early as the beginning of the 19th century. However, Smudits in an application-oriented sense dates his version of the digital mediamorphosis not until the first microcomputers or personal computers became available to the public in the late 20th century. That is when, as explained in chapter 3, the first network computer music bands emerged, notably The League of Automatic Music Composers, and then The Hub, as part of an active electronic and experimental music scene in the San Francisco Bay Area.[63] Both bands are remarkable cases of a creative and largely nonconformist use of sound technology and circuitry that the bands invented and tinkered themselves to perform music on electronic networks. Band member Chris Brown (2005) of The Hub notes, “the behavior of these circuits often determined the primary character of the music” (376). Even if both ideas of mediamorphoses fail to notice music on electronic networks in particular, they do provide a good foundation from the standpoint of media history, to locate and contextualise the subject of distance music.

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[62] A German media discussion on whether the computer constitutes a medium provided by Norbert Bolz and Friedrich Kittler (1994) in *Computer als Medium*, Wilhelm Fink Verlag, Paderborn. On a related note, Wolfgang Hagen (2005) historically traces the term "medium" dating back to ancient philosophy.

2.2.2. Input: Origins of Music Technologies

Or do Technologies fall out of the Sky?

As the theories of mediamorphoses emphasise technology diffusion and the effects of technology on music, another relevant subject is the origins of music technology. A passage on music in *A Thousand Plateaus* (1980) addresses this subject, in a sense, when Gilles Deleuze and Félix Guattari question, “What does music deal with?” They further question why musical “content is indissociable from sound expression.” They write, “a child dies, a child plays, a woman is born, a woman dies, a bird arrives, a bird flies off” (299).[64] What Deleuze and Guattari seem to stress here is that the internal nature of music relates to the natural development of life, its coming and going, its evolution. But my point in their unique take on music is the idea of “indissociability.”

Where Deleuze and Guattari understand content and sound expression as indissociable in music, similarly, historians understand music as indissociable from technology. Hans-Joachim Braun (2000: 9) states the “moment that man ceased to make music with his voice alone, art became machine-ridden.”[65] Today—given an “evolving definition of music” (Tanaka 2006: 271)—music is, as the musician and scholar Timothy Warner (2003) puts it, “inextricably bound to developments in audio technology” (xi), since music is realised and perceived through it. If sociocultural activities of music are inextricably bound to the technological, then also the technological is inextricably bound to the sociocultural. In *Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies* (2006), Kenton O’Hara and Barry Brown emphasise this mutual, or shared, relationship between the “social shaping” of music technologies—to create, circulate, and consume music—and the “technological shaping of social practices surrounding music” (16).[66] Like sophisticated music technologies today, lyres in ancient Greece also had to be imagined and shaped before anyone could shape music with them.

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[63] The Hub band member Scot Gresham-Lancaster (1998) “History of Experimental Music in Northern California,” available at http://www.o-art.org/history/index.html (April 2012). Also, Gresham-Lancaster (1998) “The Aesthetics and History of The Hub: The Effects of Changing Technology on Network Computer Music,” in *Leonardo Music Journal*, vol. 8, pp. 39-44.

[64] See also Ian Buchanan and Marcel Swiboda (2004) *Deleuze and Music*, Edingburgh University Press, Scotland.

[65] Braun refers to Evan Eisenberg’s *Recording Angel*. Merritt Roe Smith and Leo Marx (1994) provide a critical take on techno-centric views in *Does technology drive history? The dilemma of technological determinism*, MIT Press, Cambridge, Massachusetts. Sociologist Nina Degele (2002: 28-34) stresses that technological determinism is considered to be overcome within the sociology of technology.

In his essay “Bourdieu, Technique And Technology,” Jonathan Sterne (2003a) posits that “technologies are always already social and always already connected to other technologies—they exist within the always-shifting totality of a technological field” (385). I agree with Sterne’s idea on sound technologies as social artifacts; humans shape them through their ideas, circulating in large sociocultural contexts of experiences. These contexts allow the shaping of new technological realities and, in turn, new musical realities, stirring each other back and forth. Such repeated transformations, changes, or shifts, in Sterne’s above sense, do not happen all a sudden—like Gregor wakes up in bed and suddenly finds himself transformed into a “horrible vermin”—but rather as continuous transformations in music and technology.

Regarding the creation of technology, Trevor Pinch and Frank Trocco (2000) historically traced the sociocultural realities that one single electronic music instrument brought about: the Moog synthesizer. Using a concept they call Social Construction of Technology (SCOT), Pinch and Trocco identified the “relevant social groups” participating in the shaping of the Moog synthesizer and the social groups who share a common interest in the “meaning of the technology” (67).[67] SCOT, then, resembles closely what Sterne (2009) calls “philosophical reverse engineering,” where “technologies are conceptually dismembered to reveal the norms, biases, politics and cultural sensibilities that they contain.” Though SCOT sounds a promising concept, the way that Pinch and Trocco employ it follows what media theorist Hartmut Winkler (2000) (he refers to Kittler) would criticise as a "relatively plain inventor story." In Winkler's sense, such stories just portray the personal vicissitudes and destinies of any relevant inventors. Winkler does not criticise Pinch and Trocco directly, but instead Friedrich Kittler's discourse analysis in *Gramophone, Film, Typewriter* (1986), where he famously argues, "media determine our situation" (xxxix).[68] If we take a closer look at Kittler's ideas on sound reproduction, it quickly becomes clear that his analysis is more than just a "plain inventor story." Kittler situates his ideas on sound reproduction in a much larger framework of social and psychological dynamics than Winkler sees. In the following passage, Kittler's "inventor story" distinguishes the human brain from Edison's phonograph:

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[66] Donald MacKenzie and Judy Wajcman (1999) offer a discussion on the creation of technology beyond music in *The Social Shaping of Technology*, Open University Press, Buckingham and Philadelphia. Also, Bijker et al. (1999).

[67] See also Trevor Pinch and Frank Trocco (2002) *Analog Days: The Invention and Impact of the Moog Synthesizer*, Harvard University Press, Cambridge, Massachusetts. McSwain (2000: 186-99) looks at the social origins of the electric guitar.

> The principal difference between the brain and the phonograph is that the metal disk of Edison's still rather primitive machine remains deaf to itself; there is no transition from movement to consciousness. It is precisely this wondrous transition that keeps occurring in the brain. It remains an eternal mystery that is less astonishing than it appears, however. Were the phonograph able to hear itself, it would be far less mystifying in the final analysis than the idea of our hearing it. But indeed we do: its vibrations really turn into impressions and thoughts. We therefore have to concede the transformation of movement into thought that is always possible—a transformation that appears more likely when it is a matter of internal brain movement than when it comes from the outside. From this point of view it would be neither very imprecise nor very disconcerting to define the brain as an infinitely perfected phonograph—a conscious phonograph (32-3).

This passage shows well Kittler's media-centric position with reference to Edison's invention of the phonograph. Conversely, Winkler's position in media theory does not reference individual inventors. Winkler (2000) instead understands media within much larger societal processes in which "blind and intended processes overlap." In contrast to Smudits' understanding of mediamorphoses as historical phases of technological and cultural developments, Winkler (2004) understands the relationship between causes of technology and its effects as a "systematic relationship between media practices and media systems." He illustrates this relationship as a "double determination," such that "each current media system goes back to practices (side of causes), and media systems determine the space in which media practices occur.

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[68] Media scholar Nick Couldry stresses that too much media studies scholarship assumes the 'centrality' of media in society, as if media are the primary determinants and mediators of social meaning.

Both determinations are cyclically connected" (131-2).[69] In his later works, Winkler (2008) subsumes the study of media practices more abstractly as "symptom approaches" identifying the social causes of technology (102-5).

Though I agree with Winkler's position, it fails to notice the social differences of who can and cannot develop music technologies in the first place. Clearly not every musician has the engineering expertise to invent and compose a phonograph or a synthesiser. And, the other way round, not every technology inventor has the ability to create music. Instead, each human constructs a certain reality that ultimately relates to a larger division of labour. Different social groups tend to influence one another; also, music technology inventors may be directly or indirectly inspired in the creation of their musical instruments by science and engineering, and the larger surrounding music cultural life.[70] In their so-called COSTART research project on music and technology achievement, Linda Candy and Ernest Edmonds in "Creative Expertise and Collaborative Technology Design" (2004) observed that the contributing artists also engaged in the creation of technology. Yet also the "technologist was able to contribute to previously aesthetic or artistic content" (67). Of course, outside the COSTART project, artistic and technological achievement is rather complicated. But the project still provides a small-scale scenario of how the development of music and technology can result in shared social spaces, where creators and users of technology complement one another.

Both the inventor story and Winkler's systemic or cyclical approach to media technology are correct. In view of the largely under-investigated field of distance music, inventor interviews, as Pinch and Trocco employ, are crucial because they generate insights that are otherwise simply not available. As scholars can combine their tools, they can also situate inventor stories into a more abstract debate in Winkler's sense. Therefore, it really depends on the scholar and his or her available resources to compose any theory about the origins and effects of music technology.

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[69] Author's translation from German: "Das jeweils aktuelle Mediensystem geht zurück auf Praxen (Seite der Einschreibung), und umgekehrt bestimmen die Mediensysteme den Raum, in dem die Medienpraxen allein stattfinden können. Beide Determinationen sind zyklisch miteinander verbunden."

[70] Hans Fjellestad's (2004) documentary film *Moog* (Plexifilm, 72 min., United States) shows how engineer Robert Moog's sociocultural environment inspired him to create music technology. Pinch and Trocco (2002: 302-24) describe how Moog's ideas transformed into a musical instrument--the Moog synthesizer.

2.2.3. On the ‘Pre’ in Postmusic Logic

One particular position on transformations in music and technology needs an especially critical look. Cultural theorist Jody Berland claims in her chapter “Postmusics” (2008) that “music in the last century has been transformed by the concerted quest to replace the human performer/composer/producer of sound with mechanical and then digital means” (27). She thinks that digital music needs “no collaborators,” “no audience,” “no performances,” “no ears,” “no instruments,” “no practice” (27-36), and believes, “you do not have to know how to move your hands, sing in tune, count with your breath or vibrate an object with your body. You just have to study your manual, watch the screen, listen, choose and press enter” (37). With postmusic, Berland laments the fact that “musical performance takes place in the context of increasingly sophisticated technologies of reproduction, which have for the last century been promoted commercially as vehicles of inspiration, artistry and the ‘human touch’” (26). Thus Berland claims that music is not music anymore but has transformed into something else that she calls “postmusic” (33).

Berland’s idea of postmusic faces some fundamental problems. First, the term “postmusic” or, to put it another way, “aftermusic” seems illogical because we simply do not know what comes after music other than silence (though John Cage’s piece “4’33” or four minutes, thirty-three seconds of silence is considered to be music). Already the meaning of the term “music” as such without the prefix “post” is rather unclear. As the conductor Sergiu Celibidache once put in a nutshell the problem of defining music beyond its common understanding of sound organised in time: “There is no definition of music. It is outside of thought.”[71] What counts as music? What counts as a musical instrument? Who counts as a musician? Is there a ‘right’ and ‘wrong’ in this discussion?

Berland’s point mentioned above that “musical performance takes place in the context of increasingly sophisticated technologies of reproduction” is a valid one (as the interviewees in chapter 5 will further elaborate). However, I disagree with Berland’s pessimistic outlook on music and technology because it neglects the importance of human creativity and imagination in the historical development of sophisticated technologies for music-making. Besides that, one needs to view postmusic more fundamentally on the basis of temporality. Postmusic logic neglects in temporality what we identified earlier with the "input" perspective. It is a perspective on the genesis or human origins of a sound technology imagined and developed by humans, for humans—so they can act and create music with it in the first place. In what follows, I emphasise this human 'pre' in Berland's postmusic discussion.

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[71] Transcription and translation from Jan Schmidt-Garre’s (2005) German documentary film *Celibidache probt Bruckner: “Man will nichts, man läßt es entstehen,”* Bayerisches Fernsehen, September 2009, 60 min., Germany. More on Celibidache and his dislike towards sound reproduction in Piendl (2002: 106).

A first question is, how does the idea of postmusic relate to the subject of technology and human imagination? Though his following passage does not directly refer to music technologies like the player piano—which Berland condemns as a historical prototype of postmusic (27)—writer James Champlin Fernald (1896) reminds us how the invention of music technologies relates to human imagination:

> Imagination is not only poetic or literary [or musical], but scientific, philosophical, and practical. By imagination, the architect [or the musician] sees the unity of a building [or a composition] not yet begun, and the inventor sees the unity and varied interactions of a machine never yet constructed, even a unity that no human eye ever can see, since when the machine is in actual motion, one part may hide the connecting parts, and yet all keep the unity of the inventor's thought. … Science, philosophy, and mechanical invention have little use for fancy, but the creative, penetrative power of imagination is to them the breath of life, and the condition of all advance and success.[72]

In this passage, some may object to Fernald's emphasis on the talent and ability of a single inventor. However, in the late-19th century (when Fernald wrote the passage), it was before technological inventions became subject to less person-specific and more collaboratively formulated types of ideas through scientific and corporate teams. Chapter 4 on telephone music explains this in more detail.[73] What is significant is that Fernald understands human imagination as a necessary precondition for technological innovation. Hence, human imagination is also a necessary precondition for the creation of technologies such as player pianos or self-playing pianos, which Berland condemns so much because they would replace the human performer.

Music historian Jürgen Hocker traced the history of self-playing instruments. In his chapter "My Soul is in the Machine" (2000), he writes that "as long as musical instruments have existed, artisans and musicians have tried to construct instruments which play by themselves" (84). Heron's self-playing organ pipes in Alexandria from ancient times, and the mûsà automatic flute-player from Baghdad prove this. Hocker shows that Händel, Bach, Haydn, Mozart, and Beethoven also created music for some of the earliest functioning self-playing organs. The point is that before the magnificent moment a self-playing instrument could at all produce a sound by itself, the instrument and its sounds had to be imagined, planned, and realised by a human inventor or, in Pinch and Trocco's sense, a relevant social group of inventors. From these human origins, other humans can choose whether they want to feed the machine with their musical creativity or not, before which they must invent the music.

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[72] James C. Fernald (1896) *English Synonyms and Antonyms*, 19th edition, Funk & Wagnalls, New York and London, available at http://www.gutenberg.org/ files/28900/28900-h/28900-h.htm (April 2012). Cited in Frank L. Cioffi (2005) *The Imaginative Argument*, Princeton University Press, Pinceton and Woodstock.

[73] See also Donald A. MacKenzie's (1990) historical chapter on "imagining" and "Inventing a Black Box" (27-94), in *Inventing Accuracy: A historical sociology of nuclear missile guidance*, Massachusetts Institute of Technology.

Berland's condemnation of postmusic neglects the element of human imagination that self-playing instruments already embody. It also falsely represents the historical relationship between music and technology as being one-directional. It ignores that instead of self-playing instruments, the early media technology of musical notation already started to "replace" a human. Beethoven did not have to be present in person anymore when other conductors sought to perform his music. "I am the Bacchus"—as Beethoven once committed to paper—"who presses out this glorious wine for mankind … [to] make them spiritually drunken" (Comini 2008: 117). Without Gutenberg's printing press, Beethoven's musical "wine" would not be able to posthumously fascinate even the most techno-pessimistic listeners. Postmusic fails to consider that, without technologies, music would be lifeless and quiet. Humans would not have made any progress in the invention of new musical instruments and new music with them. A wealth of musical practices and different sounds would not exist, and the world would lack in cultural diversity. Music would mean voice only. As Tanaka (2006) agrees, "music, as a cultural form albeit with technical basis in acoustics and mathematics, has always drawn upon science" (284) whether mechanical, electrical or digital today.

Like the player piano back then, music computers today do not simply replace humans other than on the momentary surface of things. "By itself, a computer is a Tabula Rasa," Tanaka writes, "full of potential, but without specific inherent orientation" (273). Computer musician Martin Gretschmann of the band The Notwist states that, despite any technologies applied, crucial in music making is that one must "have an idea and compose something."[74] What Gretschmann apparently means is musical creativity; musicians should use their technologies creatively. To better understand the creative use of the musical machine, Tanaka refers to a notion called "idiomatic writing." A notion stemming from traditional music compositional techniques, Tanaka recognises with idiomatic writing the "innate musical capabilities of interactive technologies" (271). Idiomatic writing posits that "digital technologies have a voice in the way that traditional instruments do" (274). It depends therefore on the creativity of each person to discover the true musical voice of digital technologies. As a forerunner of computer music, composer Conlon Nancarrow did this for most of his life in Mexico for the self-playing piano.

It makes more sense to identify music by computers as idiomatic computer music rather than postmusic. Whereas Berland's postmusic logic criticises our modern technology-based music culture in the sense of a 'pianos right, player-pianos and computers wrong' ideology, in turn, Tanaka's notion of idiomatic writing is less biased than postmusic logic. Tanaka suggests that also digital technologies have their own inherent voices; musicians only have to elicit their unique sounds. The suspicion arises that postmusic logic seeks to destroy the image of cultural diversity in music in the sense that digital music would be inhuman, a music culture of the dead. "Where critics have found the chasm of death in the space between frames of a digital recording," Jonathan Sterne (2006a: 346) writes, "they should have found vivacious life instead." Berland's logic should consider that computers do not put an entire music culture to death, but rather have caused a partial transformation in music making by the replacement of mechanical and electrical, by digital instruments.

How, then, does this transformation in music making affect musical creativity? Instead of replacing musicians in total, digital technologies can expand musicians' creative possibilities towards new acoustic horizons. As media philosopher Vilém Flusser (1987) correctly observes, "every time a technological barrier is passed, the observers have the feeling that the technology will gain the upper hand, and it turns out each time, that the new technology opens up new creative sources" (69).[75] Following Flusser's logic, one can imagine the new technological developments in music as a melodic spring, whose purpose is not to bail out human creativity but to scoop in fresh musical ideas. Humans still decide themselves whether or not they want to support their creative impulses with technology. They are free to choose whether they want to adopt or reject playing a harp or electronic drums, or whether they want to be musically creative at all.

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[74] Author's transcription of video interview: *The Notwist: Martin Gretschmann*, by Eleonora Bianchini (2008), YouTube, 6:28 min., Italy.

[75] Author's translation from German: "Jedesmal, wenn eine technische Schwelle übertreten wird, haben die Beobachter das Gefühl, die Technik werde die Oberhand gewinnen, und es erweist sich jedesmal, daß die neue Technik neue schöpferische Quellen eröffnet."

Paradoxically, Berland would not have had the idea for postmusic without those technologies that she criticises as something beyond human. Without ideas, imagination and innovation, there would not be any technologies in the first place. Without technology, the world of ideas would be considerably poorer. Both the human and the technological are inseparable parts of the whole social symphony. Also, Berland's idea is part of this symphony in which the creation of music technologies happens—as Jason Toynbee in "Music, Culture, and Creativity" (2003) suggests—much larger "cultural processes" (110) or clusters of ideas than postmusic logic presumes. That is why the concept of postmusic historically contradicts the concept of transformation in music and technology. New technologies have always sought the attention of progressive and forward-looking composers and performers as means to expand their musical creativity, to express and produce new and exciting sounds—like the violin and piano once did. (On music and creativity see also "The Inevitable Impulse" in chapter 3.)

To summarise, musical craft and creativity are still alive in music produced with technology. First, considerable creativity, skill, and organisation went into the creation of the technology and its ready-to-use elements such as electronic beats or preformulated harmonic structures. Dick Raaijmakers, a composer of 1950s electronic music, alluded to this when he referred to the "invisible musician" within an electronic beat or sound.[76] Second, it requires a lot of training, skill, creativity, and taste to produce music—or musical arrangements for live musicians to play—with technology. So the problem of 'pre' in postmusic is simply that a lot of musical imagination, skill, and craft went into the programming, say, of an electronic beat. It is similar to how an acoustic drummer traditionally learns and practices her instrument prior to performing on stage.

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[76] Brian Morton (2008) writing on "Dick Raaijmakers," in *The Wire*, vol. 297, pp. 30-1.

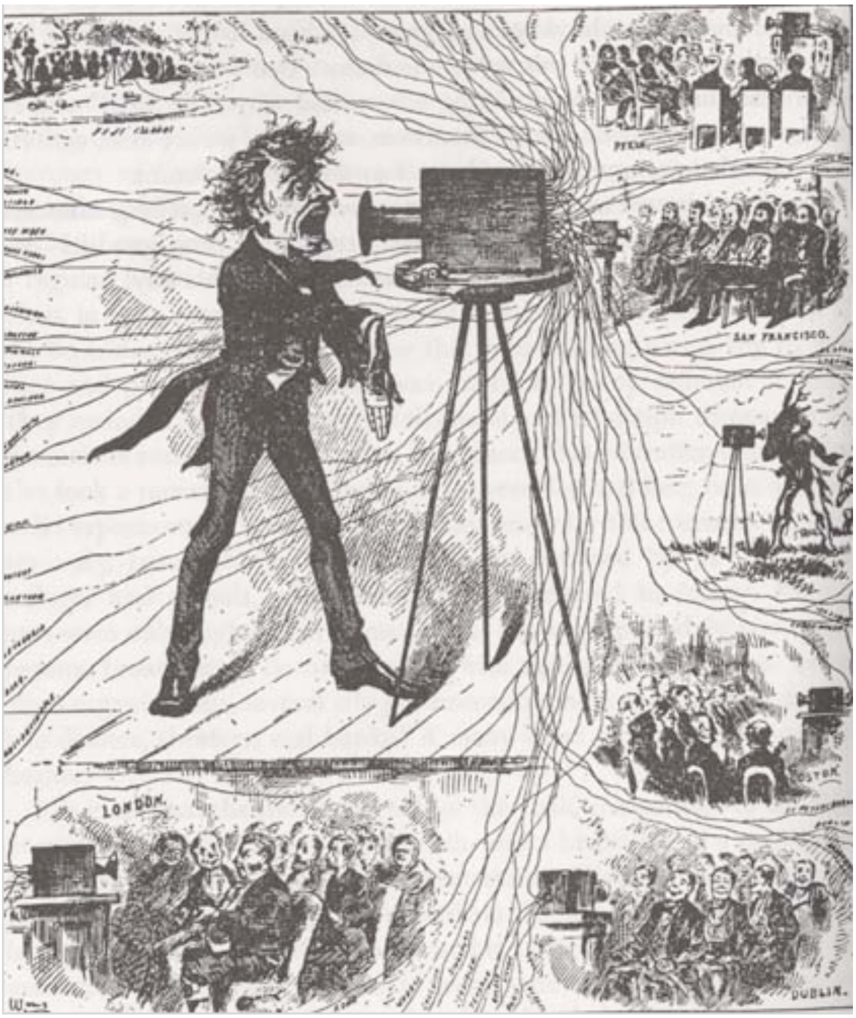
Discussion

This chapter has conceptually explored transformations in music culture and technology diffusion. It has adopted the position that transformations eventually take root also in the social, and not just in the technological sphere. Music technologies do not simply fall out of the sky, but, as Jonathan Sterne in *The Audible Past* (2003) correctly puts it, they emerge from a "changing context of research, innovation, and development" (183). Music technologies already constitute social artifacts in themselves.

As people design music technologies, performers use them to exploit the technology's creative potential. In his book *Silence* (1995), John Cage recalls that "magnetic tape was used not simply to record performances but to make a new music that was possible only because of it" (8-9). Similarly, with reproductive technologies today, musicians can creatively use them to write something new that is possible only because of the technology. Though critics may object that reproductive technologies like magnetic tape would exclude humans from musical creativity, such an objection confirms even more so that also the definitions of music and music making are constantly transforming. With reproductive technologies, musical performance today, as W. Ross Ashby would say, is "different" than it was a hundred years ago. A guitar player may work and perform on a multitrack drum recording, and while acting, he or she might imagine interacting with the distant drummer. Just as the musicians of, say, a symphony orchestra may feel deeply immersed in their performance and experience aura, similarly, performers in musical telepresence may experience aura at a distance—each human subject in his or her own unique way.

Transformations in music and technology happen systemically or, as media theorist Hartmut Winkler suggested, "cyclically," in an abstract sense of an input/output relationship. Whereas in an "input" sense, technologies affect the musicians' practices and their shaping of music, by contrast, in an "output" sense, the musical practices and experiences may influence in return the shaping, design, and improvement of new technologies. Put differently, it is a relationship between the cultural shaping of technological realities, and the technological shaping of cultural realities. Not only a few key players, but eventually the whole social symphony takes part in the transformation of music and technology. The limitations and direct influence of the individual on the technology and what it means for the discussion of distance music, theorises the next chapter.

3. Ensoniment and Distance Music



**[Fig. 6] 1877-Songline: "You stay at home and listen
To the lecture in the hall
Or hear the strains of music
From a fashionable ball!"**[77]

> If I have a book which understands for me, a pastor who has a conscience for me, a physician who decides my diet, and so forth, I need not trouble myself. I need not think, if I can only pay—others will easily undertake the irksome work for me.
>
> Immanuel Kant (1784) in "Answer to the Question: What is Enlightenment?"[78]

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[77] Cited in Lange (2003). Original name of drawing: "Terrors of the Telephone—The Orator of the Future," appeard as front page of The Daily Graphic, New York, March 15, 1877. Quote comes from voice and piano song "The Wondrous Telephone" (1877) composed by Thomas P. Westendorf.

Introduction

The last chapter provided a background on transformations in music culture and technology diffusion. This chapter discusses the subject of distance music from the theoretical aspect of the medium. The point of departure in the discussion is Jonathan Sterne's (2003) theory of "Ensoniment" detailed below. I stress in this discussion that those media of sound following the original purpose of telephony—that is, distant human interaction—involve essentially more human self-determination than those media of sound that do not follow this purpose. As a result, this chapter contributes to the Ensoniment discussion two opposing ideas on the relationship of human beings and sound media that I call *sonic heteronomy* and *sonic autonomy*.

Possibly the first thing that may strike a reader is the somewhat strange und unusual term "Ensoniment." In *The Audible Past* (2003), Sterne makes it clear by analogy, written in capital letters, referring to a moment of the past: "As there was an Enlightenment, so too was there an 'Ensoniment'" (2). What he refers to with this term Ensoniment is the influential historical epoch Age of Enlightenment, peaking in the 18th century. Enlightenment stands for an age of progress in knowledge and education and progressive thinking in philosophy, science, technology and industry, and for a time in history when the world of sound began to progress, as Sterne stresses, slowly into our "modern organisation of sound" (340). He locates Ensoniment historically "between about 1750 and 1925;" that is when "sound itself became an object and a domain of thought and practice" (2). "During the Enlightenment and afterward," he elaborates, our "sense of hearing became an object of contemplation. It was measured, objectified, isolated, and simulated" (3) by scientists, especially Hermann von Helmholtz. The latter, in his *Sensations of Tone* (1863), studied hearing and carried out experiments with sound. As Sterne explains, "hearing was reconstructed as a physiological process," resulting in the fact that "sound itself became an object and a domain of thought and practice" (2) during that historical period.

The Age of Ensoniment has not only raised awareness of sound in the sciences for hearing as a separate sense from seeing (an example would be the

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[78] Immanuel Kant (1784) "What is Enlightenment?" in ed. Paul Halsall (1997) *Internet Modern History Sourcebook*, Fordham University, New York, available at http://www.fordham.edu/halsall/mod/kant-whatis.html (April 2012).

stethoscope).[79] It has also raised the sociocultural, political, and industrial awareness of sound through new technologies. Beginning in the late-19th century, electric telephony, mechanical phonography, and (later) radio all served such purposes in the electronic mediamorphosis, contributing to the genesis and development of the music industry right into our present modes of sound consumption. With Ensoniment Sterne draws attention to the importance of sound as opposed to the dominance of sight in the Western world's shift to modern times: Ensoniment "trouble[s] the cliché that modern science and rationality were outgrowths of visual culture and visual thinking" (3). Sterne claims that the Enlightenment literature "is littered with light and sight metaphors for truth and understanding" (2-3), which might have motivated Sterne to change the metaphor into its sound-based equivalent of Ensoniment. Put another way, Ensoniment draws attention away from the media of visual perception, writing, photography, and film. It focuses instead on the comparatively marginalised media of acoustic perception.

Though Sterne's sonic equivalent to The Enlightenment is profound for how it dims the light and brightens the awareness of sound, Ensoniment also leads to a shortcoming. Sterne may be too nuanced a cultural historian who looks for continuities as well as discontinuities to argue that Ensoniment is a complete and utter break with the past; however, a shortcoming is that he sees Ensoniment as a temporal phenomenon like a phase or mediamorphosis of the past. Nothing is wrong with making a historical distinction, saying there "was an Ensoniment" mainly between 1750 and 1925. It was an important time in the development of sound in today's world. That is when humans started to approach, perceive, and organise sound more consciously in view of new sound technologies than in earlier historical eras. However, besides the Age of Enlightenment to which Sterne relates his Ensoniment discussion, there is also the philosophical *idea* of enlightenment.[80] It can be distinguished from the Age of Enlightenment because the idea does not refer to a specific time period. The *idea* of enlightenment did not originate in the Age of Enlightenment, but long before, in ancient philosophy.

The idea of enlightenment stems from Plato's influential Allegory of the Cave about 2500 year ago, as detailed later. In essence, his idea of enlightenment refers to liberation of human beings from some form of dependence. It hints at the deeply fundamental notions of autonomy, self-direction, independence, self-reliance or human self-determination. It is the Cave Allegory that, centuries later near the end of the Age of Enlightenment, Immanuel Kant alludes to in his influential essay "What is Enlightenment?" (1784), understanding it as a "release" of human beings from other-direction. Though Kant criticised the dominion, control, and power of the Christian church during a strongly authoritarian age with subjects of a monarch, it will become clear in this chapter that the idea of enlightenment is universally applicable to any other critical state of affairs such as the control and power of media-broadcasting corporations. Today, fewer people use the term enlightenment, but instead use more fashionable terms like emancipation or empowerment. Yet the fundamental idea of enlightenment as liberation of human beings from some form of dependence has remained the same. One could say that the human quest for enlightenment is always there; it will only be configured differently with the means available at different times. My point is that the idea of enlightenment reaches beyond any specific subject matter and historical time period, because the striving for independence or autonomy acts continuously in human beings. During given historical times they can realise parts of this idea.

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[79] See Jonathan Sterne (2001) "Mediate Auscultation, the Stethoscope, and the 'Autopsy of the Living:' Medicine's Acoustic Culture," *Journal of Medical Humanities*, vol. 22, iss. 2, pp. 115-36.

[80] A word on capitalisation: "The Age of Enlightment" or "The Enlightenment," referring to an historical period, are capitalised. Everything else is lowercased.

My take on ensoniment draws on Plato's early philosophical idea of enlightenment. Again, it differs from Sterne's version as he understands the term in an epochal sense—the Age of Ensoniment. Although he makes an important point, he neglects the deeper meaning when reverse engineering the philosophical idea of enlightenment, which is limited neither to sight metaphors nor to a historical classification of a specific historical epoch. By contrast, this chapter understands ensoniment as a continuously acting entity from the past, through the present, and into the future. It includes (in the time *before* Sterne's Age of Ensoniment) disciplines such as the construction of musical instruments and sound design (even before Stradivari violins) as highly refined sonic practices that embody the idea of ensoniment. As I understand it, the idea of ensoniment does not exclude per se all media of sight. For example, musical notation in the 12th century (written mediamorphosis) and music printing in the 15th century (graphical mediamorphosis) were important and liberating media technologies; with them, people organised and visually recorded sound for later generations. By no means am I saying that Sterne's discussion on Ensoniment is wrong. What I suggest instead is to expand his use of the term to mean a process, and not just an historical epoch. As a result, my idea of ensoniment reflects a striving for autonomy on the part of humans–here with the help of certain types of sound technologies.

From Sterne's discussion on Ensoniment, one could get the impression that all types of sound technologies would mean liberation. This might be true to a certain extent. However, should Ensoniment really mean progress in knowledge and innovation, as Sterne suggested earlier, our "modern organisation of sound," then we must remember that the modern organisation of sound also implies the industrialisation of sound (what Adorno earlier called the "machinery of distribution"). And we must also remember that through the industrialisation of sound in the modern world the manipulation of human beings increased dramatically. For example, in Germany from 1933 to 1945, millions were forced into sonic dependence through political mass propaganda on the Volksempfänger or People's Receiver in Germany under Joseph Goebbels.[81] One could see in this dark historical relationship between human beings and sound media a clear scenario of sonic heteronomy.

By contrast, it might seem a cliché that two-way media of sound allow greater independence between distant actors than the Volksempfänger. However, the importance of two-way media of sound cannot be stressed enough since there has emerged a distinctive regime, a new cultural-technological formation of sound on two-way media. Particularly with the emergence of personal computers and the Internet in the late 20th century, more and more scholars articulate what philosopher of science Thomas Kuhn (1962) called a "paradigm shift" and Smudits the "digital mediamorphosis." In music, it alludes to a shift in the creative use of technology and a new interaction paradigm. Musicians can now engage in the creation of sound simultaneously and collaboratively at a distance only because of two-way or interactive media.[82] In network music, artists recognise a liberating, democratic moment, and a new participatory dynamic in their performance practices.[83] Though I do not agree with some of his writing, sociologist David Gauntlett (2011: 8) nevertheless aptly characterises this new, modern aural/audio or cultural-technological formation of sound as a creative "shift away from a 'sit back and be told' culture towards more of a 'making and doing' culture." The idea of ensoniment hints at this striving of people from a restricted mode of consumption to a self-directed, or freer exchange of information in sound media.

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[81] Documentary film *The Goebbels-Experiment* (2005) reads Goebbels' diaries, providing first-hand insight into the Nazi's use of sound media for mass manipulation until 1945, directed by Lutz Hachmeister, First Run Features, 108 min., Germany and United Kingdom.

[82] Thomas Kuhn (1996: 89) *The Structure of Scientific Revolutions*, 3rd edition, University Of Chicago Press, Chicago and London. On paradigm shift in music, William Duckworth (2005: 158-9) *Virtual Music: How the Web Got Wired for Sound*, Routledge, New York and London. Also Barbosa (2003, 2006).

[83] David Kim-Boyle (2008) "Network Musics - Play, Engagement and the Democratization of Performance," *8th International Conference on New Interfaces For Musical Expression*, Genova, Italy, pp. 3-8. Also Rohrhuber (2007), Föllmer (2005).

Again, this chapter differentiates, on the one hand, between the Age of Ensoniment in the sense of a historical period, and, on the other hand, the idea of ensoniment. It draws on the philosophical idea of enlightenment in Plato and Kant's sense of a liberation or release of human beings from dependency. With this idea of ensoniment in mind, I suggest the following two notions of *sonic heteronomy* and *sonic autonomy*.

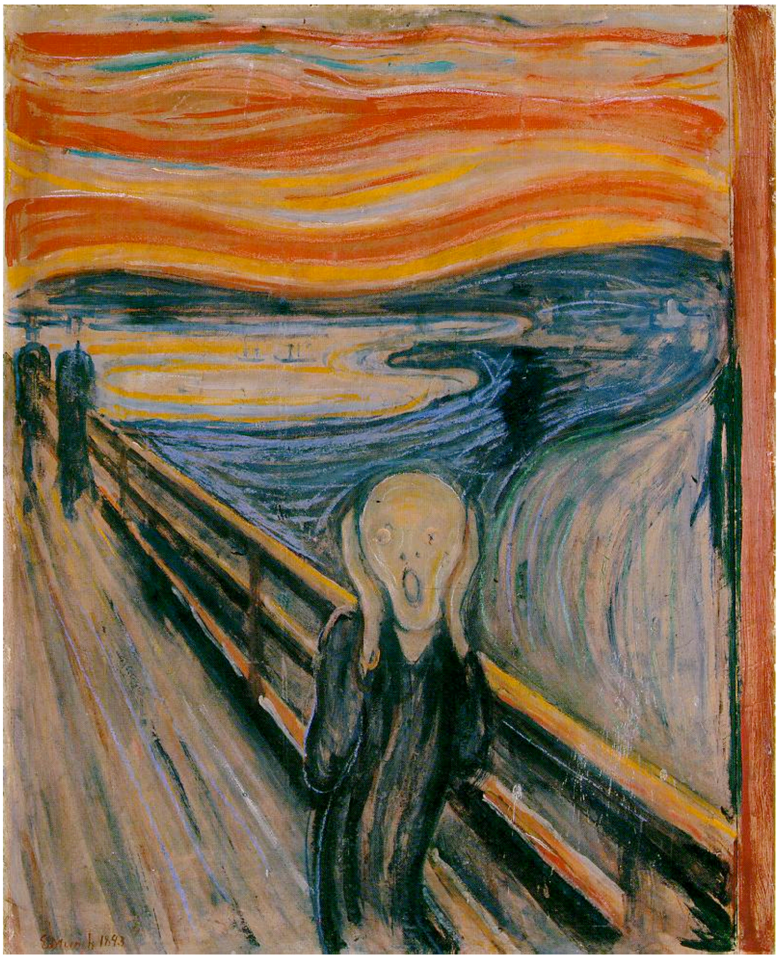
Analytically, the first part of the chapter reflects on the notion of sonic heteronomy—that is, the thinking of human other-direction through media of sound—by engaging with the ideas of Jules Verne, Marshall McLuhan and Plato. In his largely lost science fiction short story "Une Ville Idéale," written in 1875, Verne provides a compelling episode on music in the year 2000. It portrays radical transformations through technologies of sound—technologies that would determine modern acoustic culture as if in McLuhan's global village. McLuhan's concepts of visual and acoustic space delineate, comparable to Verne, radical assumptions on how globally networked technologies would push modern sound culture back into a primitive, as Plato would say, "unenlightened" state of the past. McLuhan's account of visual and acoustic space will show what Sterne (2003: 2-3) actually criticises in media theory as the "pervasive narrative" of how "Western culture moved away from a culture of hearing to a culture of seeing."

For about 2,500 years, Plato's Cave Allegory has offered a fascinating story on enlightenment thinking. It contrasts "unenlightened" with "enlightened," and shows that the idea of enlightenment preceded the historical period of the Age of Enlightenment. Plato's Cave informs the notion of sonic heteronomy and serves also as a bridge to the next chapter section on sonic autonomy, starting with Kant's idea of enlightenment. It serves as a bridge because Plato's Cave is not only about dependency; it also shows a "way out" of dependency. Michel Foucault's (1984) essay "What is Enlightenment," written on the 200th anniversary of Kant's enlightenment essay, interpreted Kant's definition of enlightenment as something negative: "Kant defines *Aufklärung* [that is German for Enlightenment] in an almost entirely negative way, as an Ausgang, an 'exit,' a 'way out'" (34). What Foucault overlooks here is Kant's subtle hint at (it is subtle because Kant does not name him) Plato's "exit" of the cave as a metaphorical way out into liberty, independence, or autonomy. In fusing science fiction, media theory and philosophy, the first chapter section uses the notion of sonic heteronomy in a sense of human other-direction with data being externally imposed upon humans through one-way media of sound. In an abstract sense, sonic heteronomy means a type of acoustic bondage, limitation or absence of freedom.

By contrast, the second part of the chapter portrays the notion of sonic autonomy. Analytically, it draws mainly on ideas by Kant, Emerson, and a psychological model. First, I will consider Kant's essay "What is Enlightenment?" (1784) relative to an early creative use of telephone networks in the late 19th century. Largely self-directed, autonomously acting musicians changed the original purpose of the telephone network as speech transmission medium to create a musical jam session instead. Second, the 1970s American avant-garde band The League of Automatic Music Composers, which later became The Hub, provides a more recent and progressive form of music on electronic networks. I will compare the bands' unique approach to collective musical creativity on electronic networks to American philosopher Ralph Waldo Emerson's essay on radical "self-reliance" (1841). I emphasise, with respect to sonic autonomy, that there are resemblances between their apparently different ways of thinking. Finally, using a behavioral psychology approach to musical creativity, I then seek to understand the primary impetus that makes humans want to become involved in electronic networks in the first place. In a more general sense, sonic autonomy considers the importance of two-way media for a democratic and free exchange of information at a distance as opposed to other, more restricted forms of media use.

This chapter primarily envisions the idea of ensoniment as one of a drive or a gradual shift in thinking from sonic heteronomy to autonomy. My position neither takes a clichéd opposition to the stream of 'big' music, nor is it just a description of the situations in which network musicians seek to perform autonomously. It is instead a distinction about media theory. The notions of sonic heteronomy and sonic autonomy cannot be understood as rigid or fixed bipolar categories, but rather as two dynamic poles with flowing boundaries between them. Sonic heteronomy and sonic autonomy hold no claim on exclusivity; there is a sense of a continuum with shades of grey between them. Network musicians do not have total autonomy, but they mostly determine their own content.

3.1. Sonic Heteronomy



[Fig. 7] Norwegian painter Edvard Munch's "The Scream" (1893). Munch explains, "I was walking along a path with two friends—the sun was setting—suddenly the sky turned blood red—I paused, feeling exhausted, and leaned on the fence—there was blood and tongues of fire above the blue-black fjord and the city—my friends walked on, and I stood there trembling with anxiety—and I sensed an infinite scream passing through nature."[84]

3.1.1. Future Shock: Electric Concerts in the Ideal City

Suddenly, he must have felt distracted and other-directed. An extraordinary sonic sensation or electric scream had struck his sensitive human ears. The sounds he heard had "nothing human, but also nothing celestial! Everything was changed, too!

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[84] Munch's diary memo "The Scream," Nice, January 22, 1892 in Iris Müller-Westermann and Edvard Munch (2005: 43) *Munch by Himself*, Royal Academy of Arts, London. For Photography, see Nicolas Pioch (2002) "Munch, Edvard," In: *The Public's Library and Digital Archive*, photographed by Mark Harden, available at http://www.ibiblio.org/wm/paint/auth/ munch/ (April 2012).

Uncut musical phrases, no middle! More melody, more measures, more harmony! … The sound of algebra! The triumph of dissonance! … it is the music of the future!"[85] That is how French science fiction writer Jules Verne begins telling a compelling episode, as Michael Chanan (1995: 148) would say on the "electrification of music and cultural traditions" in Verne's short story "Amiens in the Year 2000," first published in 1875, then renamed as "Une Ville Idéale" or "An Ideal City" in 1910. Verne, in first person narrative, undertakes a mind-bending journey 125 years in the future through the French city of Amiens—Verne's home, located north of Paris. In the year 2000, Verne finds his city radically morphed and transformed in its architecture, streets, and places, as well as in its political, medical, and cultural traditions and atmosphere. However, what is most intriguing is how Verne continues to report on the music of the future, shocked by its dramatic electronic mediamorphosis.

"No.1—Reverie in A Minor on the Square of the Hypotenuse" was the name of the first electric scream that struck Verne's ears as if a modern techno sound. With his "ears bleeding," he quickly fled these strange cybernetic sounds of mathematics. They made him shudder, evoked in him enormous need of "air, space, desert and absolute silence." He found silence in a peaceful city park, near Place Longueville, where he remained inside to rest his sensitive ears, enjoying the soundscapes of pure nature. After Verne continued his journey through Amiens, he again suddenly encountered another schizophonic experience near Rabuissons Street. This time, it was a sheer wall of noise and contained loud and wild sounds. They thundered to him from an applauding crowd in a "vast hexagonal monument with a superb entrée." This monument "was both a circus and a concert hall," large enough for at least five bands to "fuse their chords" simultaneously. In the concert hall's entrée, two "huge posters" announced in uppercase the virtuoso playing live at a distance "PIANOWSKI—PIANIST OF THE EMPEROR OF SANDWICH ISLANDS." Verne knew "neither the emperor nor his ordinary virtuoso." Trying to learn more about Pianowski, Verne starts the following conversation with a bizarre-looking creature outside the grand concert hall:

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[85] Author's translation from French of following quotes based on Jules Verne (1875 [2007]) "Amiens en l'an 2000," available in *Jules Verne Virtual Library*, originally published in *Mémoires de l'Académie d'Amiens 1874-1875*. English version: Jules Verne "An Ideal City," in *Yesterday and Tomorrow* (1910, reprint 1964: 47-67), ed. Idrisyn Oliver Evans, Ace Books, New York City.

> [VERNE]: “And when has Pianowski arrived?” I asked a dilettante recognisable by the extraordinary development of his ears.
> [CREATURE]: “He has not arrived,” replied the native who looked quite surprised at me.
> [VERNE]: “So when will he arrive?”
> [CREATURE]: “He will not,” replied the dilettante who also seemed to say “But you, where have you been?”
> [VERNE]: “But if he does not come here,” I said, “when will he give his concert?”
> [CREATURE]: “He gives it right now.”
> [VERNE]: “Here?”
> [CREATURE]: “Yes, here, in Amiens, at the same time as London, Vienna, Rome, St. Petersburg and in Beijing!”
> Ah, I thought, all these people are crazy! …
> [VERNE]: “Sir…” I replied.
> [CREATURE]: “But, Sir,” replied the dilettante, shrugging his shoulders, “check the poster! Don’t you see that this concert is an electric concert!”
> I read the poster! ... Indeed, at this very moment, the famous pianist Pianowski [broyeur d’ivoire], played in the Hertz Hall in Paris; however by means of electrical wires his instrument was put in connection with pianos in London, Vienna, Rome, Petersburg and Beijing. When he was hitting a musical note, the identical note sounded from the keyboard of the remote piano of which every keystroke was instantaneously driven by voltaic current!
> I wanted to enter the hall! It was impossible! Ah, I do not know if the concert was electric, but I can swear that the spectators themselves were electrified! No! no! I was not in Amiens! It was not in this wise and serious city that such things will happen!

Verne’s story is noteworthy because it provides an informed and critical idea on technological reproduction and distributed musical interactions. On closer inspection, it reaches beyond pure fantasy of music transmission and the unlimited imagination of what he coins a “dream” experience. For instance, for his idea of Pianowski’s electric concert in France, Britain, Italy, Austria, Russia, and China, Verne draws on detailed sociocultural and technological facts of the 19th century. People then, literary scholar Nicoletta Pireddu (2010: 36) notes as to media diffusion, were familiar with the fictional “topos of spatial and/or temporal displacement” from earlier science fiction stories, and they could already exchange messages over telegraph networks globally by the 1870s.[86] “No doubt,” comments telematic engineer Jeremy Cooperstock (2009), Elisha Gray’s 1870s experiments in sound reproduction and musical telegraphy “inspired” Verne’s perception of distance music and the destruction of traditional musical values in favour of new telecult values and electric concerts in the future. Verne might also have been inspired by other preceding contributions to the new medium such as Philipp Reis' early cybernetic experiments in sound transmission using musical telegraphy in the 1860s. On the other hand, it appears doubtful that Verne sought inspiration from his compatriot Clément Ader. Ader's famous auditions téléphoniques in Paris came years later, in the 1880s (see "Differentiation of Telephone Music" in chapter 4). Perhaps Verne's statement on early distance music inspired scientist Ader in his invention of telephone music.

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[86] Nicoletta Pireddu “Introduction: Paolo Mantegazza, Fabulator of the Future” (1-56), in Paolo Mantegazza *The Year 3000: A Dream* (1897 [2010]), ed. Nicoletta Pireddu, University of Nebraska Press, Lincoln and London. On telegraphy, Faulstich, (2004: 48-60) and Hartmann (2006: 34-78).

In addition to the idea of media diffusion and technological reproduction, the naming of the concert hall is somewhat symbolic of a social figure in Verne's time. At first glance in analytical reverse engineering, the name of the electric concert venue Hertz Hall in Paris as the only site where Pianowski plays in person, seems an eponym to German physicist Heinrich Hertz's contributions to early electric wireless media, telegraphy and radio broadcasting. However, at second glance the name Hertz Hall suggests that Verne named it instead after his contemporary, the Austrian pianist Henri Herz, without a "t." Like Pianowski in the story, the real-life Henri Herz was an agent of the ordinary light, and to recall Benjamin, "distracted" music for the masses. Similar to Pianowski who electronically reproduced his piano play at a distance, Herz gave piano concerts worldwide, and besides having his own piano factory, also owned his own concert hall in Paris.[87] The deciding factor for pianist Henri Herz as eponym is that physicist Heinrich Hertz was barely mature and "still undecided between a career in engineering or science" when Verne conceived his story in 1875.[88]

Verne turned his dream into a science fiction story; this allowed him to use it to transcend the contemporary technological knowledge on sound reproduction and present a vision of future music. He criticises technological progress in the sense of the Native American Hopi word "koyaanisqatsi," meaning a "crazy life," a "life in turmoil," a "life out of balance."[89] It became apparent from Verne's pessimistic outlook on the new developments of electricity in the late 19th century that the future would involve a crazy musical life and experience. “Voltaic currents,” he says, would lead to the loss of a human element in the music of the future. Science and technology would transform live concerts into inhuman, monstrous electric concerts with globally dispersed performers and audiences themselves being “electrified.” Cultural theoristcritic Jody Berland would view it as a scenario of pure postmusic, directed by manipulative technology alone; and futurist Alvin Toffler (1970) might add that Verne envisioned a global “future shock” perhaps of techno sound.[90] It would not be surprising if Verne had shocked his own audience at the Academy of Letters, Sciences, and Arts in Amiens. There he was appointed director and predicted the city’s future of music in his 1875 speech “Amiens in the year 2000,” later renamed in “Une Ville Idéale” (“An Ideal City”). Verne predicted a radically mediatised future of distance music; and his predictions bear resemblances to Marshall McLuhan’s later account of media transformation and the role of sound in the global village of the future.[91]

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[87] See Diane O. Ota (1972) *Henri Herz: Virtuso, Composer, and Piano Manufacturer*, Master of Arts, Smith College, Northampton, Massachusetts. Also, Henri Herz (1866 [1963]) *My Travels in America*, trans. Henry Bertram Hill, The State Historical Society of Wisconsin, Department of History, University of Wisconsin, Madison.

[88] John H. Bryant (1998: 48) "Heinrich Hertz's Experiments and Experimental Apparatus: His Discovery of Radio Waves and His Delineation of their Properties," in: ed. Davis Baird and R. I. G. Hughes, *Heinrich Hertz: Classical Physicist, Modern Philosopher*, Kluwer Academic Publishers, Dordrecht, The Netherlands. Also Andrzej Zydorczak of the Polish Jules Verne Society credits Henri Herz in a comment on "Une Ville Idéale."

[89] The term is defined in Godfrey Reggio's same-named film *Koyaanisqatsi* (1982), Blue Dophin Film, 86 min., United States.

3.1.2. Global Soundspace: Back into the Acoustic Past

By the 1960s, that is, eight decades after Verne’s science fiction narrative on future music, electricity and technologies of sound had actually become a global reality. Telephone music had long faded into obscurity; it gave way to new ways of distant listening, radio broadcasting, then television. Musical shows like *Jukebox Jury* in the United States and similar shows in Great Britain started to immerse and inhabit listeners’ minds. Computers and satellites were about to unite the world of sight and sound more thoroughly than their predecessors—the “Victorian Internet” of telegraphy and telephony a century before (see “Cultivation of Musical Telegraphy” and “Differentiation of Telephone Music” in chapter 4).[92]

On May 18, 1960, Alan Millar and John O’Leary, hosts of the Canadian TV show *Explorations*, interviewed Marshall McLuhan on “The Global Village.” In a small, local bookstore as the interview setting, McLuhan talked about the repercussions, output or effects of electronic media particularly on what he calls the "literary man" in the Western world. "These new media of ours," McLuhan rumbled over the old black and white television screen, have conducted "our world into a single unit." The "world is now like a continuously sounding tribal drum were everybody gets the message all the time." Consider a "princess [who] gets married in England, and boom, boom, boom goes the drum. We all hear about it ... [Next], a earthquake in North Africa ... or a Hollywood star gets drunk—there go the drums again." McLuhan's argument is that new media transforms the "literary man" of the Western world into its enemy, the mediatised version of the "tribal man." What explains this regression better are McLuhan's phrases "away-from-it" and "with-it," denoting a highly cultured, concentrated or civilised life *away* from literature to an uneducated and distracted life *with* the new visual and acoustic media. Even if he might actually have had a positive attitude towards media (given his own TV interview), McLuhan argues in the face of global media transformation about a "loss of individualism" towards a new obsession, a fetish in favour of communalism, particularly with "today's teenagers." They feel "especially at home with our new gadgets, the telephone, the television." Teenagers "will bring our tribe even closer together." They are the telepresent "future villagers."[93]

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[90] Alvin Toffler (1970) *Future Shock*, Random House, New York. Based on Toffler, see also Alexander Grasshoff’s documentary film *Future Shock* (1972), narrated by Orson Welles, McGraw Hill Films, 42 min., United States. Toffler’s *Future Shock* inspired also Curtis Mayfield’s song “Future Shock” on *Back to the World* (1973), Herbie Hancock’s album *Future Shock* (1983), and the emergence of Detroit Techno.

[91] A critical music future portrays also J. G. Ballard’s (1960) short fiction “The Sound-Sweep,” in *Science Fantasy*, vol. 13, iss. 39, February 1960.

[92] Tom Standage (1998) *The Victorian Internet: The Remarkable Story of the Telegraph and the Nineteenth Century’s On-Line Pioneers*, Walker & Company, New York.

Similarly, Jules Verne reports a future of tribal actions. To recall his story of future music or postmusic, Verne portrays this tribal behaviour by reference to Pianowski's electrifying and globally telepresent concert, full of uneducated, "dilettante," "wild," "native" peoples. They are Pianowski's uncultivated and "crazy" concert audience to whom Verne relates the picture of tribalism just as for the unenlightened artist himself. Before his present career, Pianowski used to play for the emperor of the wild tribes of the "Sandwich Islands" in the Pacific—(how Captain Cook named Hawaii in 1778.)[94] Moreover, both Verne and McLuhan add another effective image to tribalism, one of media diffusion and content-related trivialism. Whereas McLuhan deems a big earthquake in North Africa as trivial as a drunken Hollywood star, Verne deems Pianowski banal by calling him a "broyeur d'ivoire" or "crusher of ivory." Verne's slogan makes sense only if one knows that versed piano makers traditionally covered piano keys with the precious and exotic material of ivory.

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[93] Author's transcription of television "Interview with Marshall McLuhan: The Global Village," in *Explorations*, hosts: Alan Millar and John O'Leary, Canadian Broadcasting Corporation, May 18, 1960, 8:44 min., Canada.

[94] See Paul Capper's (1996) chronology of Capain Cook's voyages "The Third Voyage (1776-1780)," available at http://www.captaincooksociety.com/ccsu65.htm (April 2012).

By calling Pianowski an ivory crusher, Verne hints at or suggests the artist's lack of tradition, musical knowledge and ensoniment. He unmasks Pianowski as a musical amateur, a primitive showman of the future who beats his exotic piano keys at a distance like a tribal man from Africa. In some ways, Verne anticipated the racist-tinged criticism of African-American jazz and ragtime a few decades later, terming it cacophony.

In McLuhan's late-1970s essay "Visual and Acoustic Space," he improves his theory on how distant sound reproduction would transform the literary man into the tribal man.[95] "Visual and Acoustic Space" criticises the decay of sight in relation to sound, and charges for this loss of aura, among others, the "technical wavesurfers Marconi and Edison." McLuhan theorised that their groundbreaking pre-cybernetic inventions and contributions of the radio and gramophone would cause a "new tribal echo" and machinery of distribution, that, in concert with satellites and computer networks, would "intensify the attack on the printed word." He projected that by the year 2000 "most printed matter" would have morphed to be available electronically or digitally in new "acoustic and visual modes." McLuhan's point is the "new interplay" between these acoustic and visual modes in "our skulls," skulls that "contain two brains straining to be psychically united." (72) His term "two brains" points to an important line of thought on the history of human sensory perception.

With "two brains," McLuhan means two different spaces in one head. One head space he calls the acoustic space, and another the visual space. Visual space acknowledges the neural activities on the left side of the human brain "like the 'mind's eye' or visual imagination, which dominates the thinking of literate western people" (71). Visual space implies a sequential or unidirectional mode of thinking based on reading the printed word lineally—letter by letter, word by word, line by line, page by page, and a whole book from beginning to end. When this linear mode of thinking evolved slowly across centuries from the written to the graphical mediamorphosis, McLuhan failed to realise that in visual space the technological innovation of the book index should have already started to transform linear thinking into what we now know as hyper textual thinking. This changed the mode of thinking because readers could skip around the contents, and no longer had to read a whole book to find specific knowledge and information.

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[95] Marshall McLuhan (2004) "Visual and Acoustic Space" (67-72), in ed. Christoph Cox and Daniel Warner, *Audio Culture: Readings in Modern Music*, The Continuum International Publishing, New York.

The other head space is the acoustic space; it parallels the neural activities on the right side of the human brain. Should visual space be like the mind's eye, then acoustic space is "like the 'mind's ear' or acoustic imagination that dominates the thinking of preliterate and postliterate humans alike" (71). Preliterate humans probably lived in a rough, vague, and scattered "ear culture" (69) without any means of inscription beside cave painting, at least until the ancient Greeks invented phonetic literacy. However, in spite of preliteracy or postliteracy, the human ear culture lacks linear or focused thinking since it primarily follows a spherical or multidirectional mode of thinking and acoustic perception. As McLuhan elaborates, "there are no boundaries to sound. We hear from all directions at once … Sounds come to us from above, below, and the sides" (68). (From the standpoint of media history, acoustic space as a media concept appeared recurrently in McLuhan's and anthropologist Edmund Carpenter's early publication *Explorations* between 1953 and 1959.[96])

In conclusion, then, both Verne and McLuhan share a similarly skeptical view of technological reproduction, which could lead Western culture back into the cave as unenlightened acoustic past in sonic heteronomy. It is significant how both thinkers relate this acoustic past to the supposedly primitive lives of native peoples. What Verne shows through Pianowski's wild and uncultivated electric concert, McLuhan conveys through the image of new electronic media and the tribal drummer.[97] Though McLuhan and Verne share certain images about native peoples and technology to exemplify a future of sonic heteronomy, their writing differs in the methods used to convey them. Verne uses the image of native peoples as a narrative gimmick or clichéd vocabulary of primitivism, whereas McLuhan tends to exploit it less as a gimmick, but instead more systematically. (In contrast to Verne the science fiction novelist, McLuhan studied the media and formulated theories as to how it worked.) I do not suggest that he uses the language of tribalism to show backwardness and regression into the cave in general through the media, because McLuhan may be considered more of a techno-optimist than a techno-pessimist (Arthur Kroker (1997: 94) has called it McLuhan's "technological humanism"). Yet in the sub-text of his tribal drum jargon there resonates a rather pessimistic understanding of aboriginal culture used as negative metaphor to describe a new acoustic culture on electronic networks. I do not think McLuhan is aiming to humiliate aboriginal culture, even though he, like Verne, uses some of the clichéd vocabulary of primitivism in relation to media diffusion. McLuhan's dislike for the tribal man in acoustic space—as opposed to the modern literary man in visual space—makes itself felt as though the new media of sound were an aboriginal threat to the literary culture of the enlightened man. Hence, both thinkers' positions portray an image of the media of sound directing the life of man in sonic heteronomy, as opposed to people directing their own lives towards sonic enlightenment.

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[96] See R. Murray Schafer (2007) "Acoustic Space," in *Circuit: Musiques Contemporaines*, vol. 17, pp. 83-6. John Cage in *Silence* (1995: 9) used a similar phrase to acoustic space of what he called a "total sound-space, the limits of which are ear-determined only."

[97] More on tribal drumming, see Marshall McLuhan (1964) "Radio: The Tribal Drum," *Educational Technology Research and Development*, vol. 12, iss. 2, pp. 133-45.

3.1.3. Shadowsounds: In the Caverns of Ancient Cyberspace

It is remarkable how McLuhan's idea of acoustic space in the global village and Verne's idea of future music in the "Ideal City" reach back to an ancient fable: the Cave Allegory. Socrates never bothered writing to record his ideas. Instead, he roamed around Athens and discussed philosophical questions face-to-face with the people—discussions that the city's rulers saw as a threat. They accused Socrates of "corrupting the youth" with his critical and progressive thinking that often challenged the city's conservative authorities. They found Socrates guilty, and finally condemned him to death in 399 B.C.E.[98] Socrates' student Plato, who knew how to write, was horrified by his master's execution due to undemocratic standards and the ignorance of Athens' rulers. This tragic incident inspired Plato to write *The Republic* (360 B.C.E.) about the "search for the ideal political constitution" in an ideal state or city of the future.[99] In Book VII of *The Republic*, Plato reports Socrates' Cave Allegory, which I will outline below, and then relate its idea of independence and autonomy of the human subjects to Verne's and McLuhan's discussion on media of sound.[100] Plato's Cave introduces the metaphors of "enlightened" versus "unenlightened" to stress the importance of an unfettered, liberated, or open exchange of information. It supports the progression of knowledge and education and the advance and success of an improved human culture.

Even though based on light metaphors, Plato's Cave informs the notion of sonic heteronomy insofar as it portrays metaphorically a situation in which media control human thought in one direction—they give out, but suppress a response. As philosopher Jorn K. Bramann (2009) (who writes on Plato's idea of enlightenment relative to contemporary media) puts it more radically: "Since most of the important media are either owned or controlled by wealthy and otherwise privileged groups, it is next to impossible to really enlighten the masses—in the same way in which slaveholders once had an interest in keeping their slaves in a state of illiteracy, ignorance, and thus helplessness." Perhaps it is a farfetched interpretation of the cave allegory to compare contemporary media to slaveholders. Plato's Cave also points to, in a positive and constructive sense, an "exit" or a "way out" of bondage or rather ignorance—what Foucault (1984) misinterprets as something "negative" in Kant's (1784) essay on Enlightenment. What will eventually become clear is the idea of ensoniment not as an historical classification in Jonathan Sterne's (2003) sense, but in Plato's sense of enlightenment as liberation, emancipation or empowerment of human beings—a release from the oligarchy of sonic heteronomy.

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[98] Edward Craig (2002: 14) *Philosophy: A Very Short Introduction*, Oxford University Press, New York.

[99] Craig (2002: 11).

[100] A "constant feature of Plato's dialogues is the presence of Socrates." Thus it is not always clear "where to draw the line" between Socrates' and Plato's thoughts because Plato also used the "figure of Socrates as a literary device to convey his own philosophy" (Craig 2002: 12).

"And now … let me show in a figure," Socrates starts telling the Cave Allegory, "how far our nature is enlightened or unenlightened."[101] Imagine prisoners living in an underground cave with a narrow ascent, a small exit and way out to the sun (see Figure 8 below). Only some diffused sunlight shines through this exit down into the cave. The prisoners have been here since their infancy. With their "legs and necks chained," the prisoners cannot move, and can only see what happens in front of them on the cave wall. Behind the prisoners in the cave, a "fire is blazing at a distance," and "between the fire and the prisoners" lies a small roadway. It has a small wall that looks like a screen, similar to that which showmen have before them when playing their puppets. Occasionally people pass through the roadway, carrying all sorts of "objects" like "vessels, and statues and figures of animals made of wood and stone" that cast moving shadows on the cave wall through the light of the fire. The prisoners can see nothing else than these shadows cast before them on the wall, and they can hear only a remote or distant "echo" from people talking in the cave. Would the prisoners not assume, Socrates questions rhetorically, that the echoes of the voices "came from the passing shadows?"[102]

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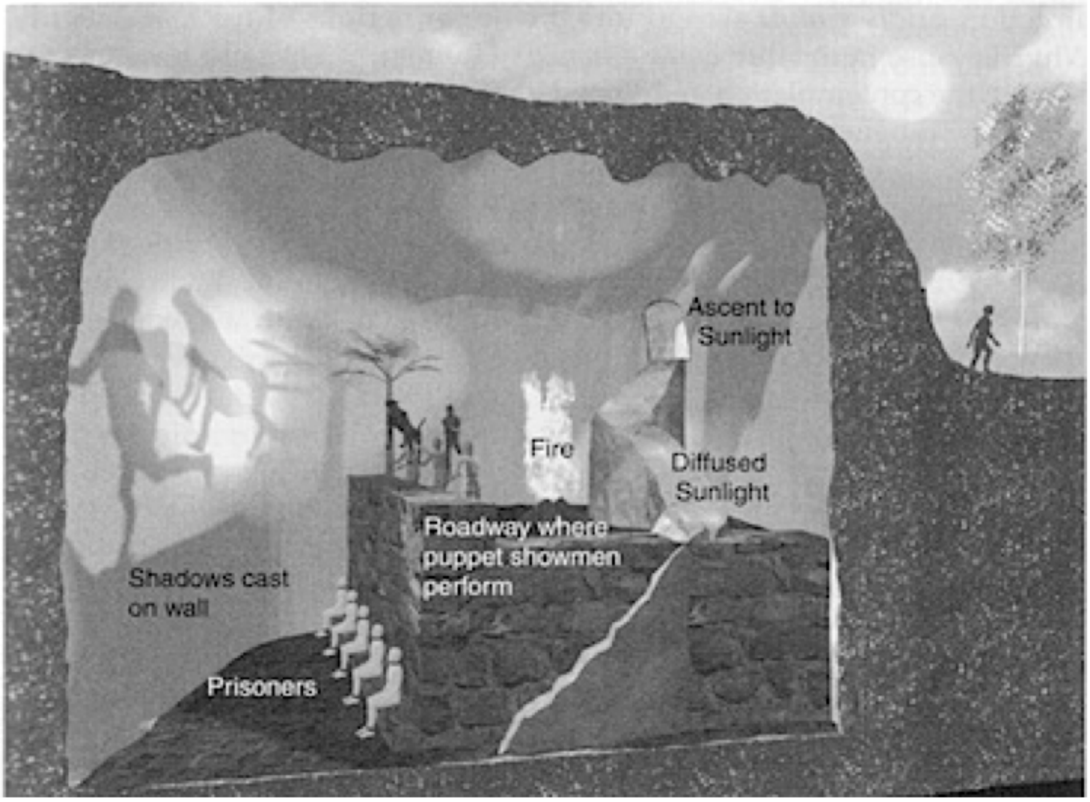
[101] I took all following Cave Allegory quotes from Book VII of Plato's *The Republic* (360 B.C.E.), trans. Benjamin Jowett, in: Daniel C. Stevenson (2009) *The Internet Classics Archive*, MIT, Cambridge, Massachusetts, available at http://classics.mit.edu/Plato/republic.html (April 2012).

[102] The Cave Allegory appears originally as dialoge between Socrates and his disciple Glaucon. I omitted Glaucon's answers because they are all in the affirmative.



[Fig. 8] Plato's Cave, around 360 B.C.E.[103]

Now, suppose that some liberator would release a prisoner, enabling her to ascend from the cave outside "towards the light." Many years of captivity in the dark hinder the ex-prisoner to "see the realities" in the sunlight. She finds it hard to believe that the sunlight brings a "more real existence," and that the shadows were merely a false image or an "illusion." She still holds the shadows "truer than the objects." Only with time, the initially, confused ex-prisoner starts to adapt to her new life in liberty. Wouldn't she, as Socrates rhetorically questions, "felicitate" herself "on the change, and pity" her old fellow prisoners back in the cave? Suppose they were in the "habit of conferring honours among themselves," like a competition of who can better identify the "passing shadows" on the cave wall, and "draw conclusions as to the future." Don't you think, as Socrates continues, the ex-prisoner would feel quite indifferent about these "honours and glories, or envy the possessors of them?" Now suppose that the ex-prisoner would relapse and suddenly return "out of the sun" back into the cave for a moving shadow contest. Her eyes would be "full of darkness." She would not see anything.

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[103] Pijama Surf (2011) "Guardianes de la Matrix: ¿Programan nuestra realidad inteligencias extraterrestres?" available at http://pijamasurf.com/2011/03/guardianes-de-la-matrix-¿programan-nuestra-realidad-inteligencias-extraterrestres/ (April 2012).

What does the Cave Allegory mean regarding the notion of enlightenment? In his chapter “Plato: The Failure of Democracy,” Bramann (2009) responds that the Cave Allegory models “four stages through which a person has to pass to get a sound education,” and that “these stages are distinguished by what a learner is able to see”—shadows, puppets and objects, original things, and the sun. “An ignorant person,” Bramann details, “can see only shadows—without even suspecting that they are not real things.” However, “a fully educated person can see the shadows, the puppets that cast the shadows, the original things after which the puppets are modelled, and the sun that makes the original things visible.” Whereas the “shadows on the wall stand for the notions of things that people have in their minds,” the “puppets and objects from which the shadows are cast stand for what we call real things.” Finally, Bramann suggests that the symbol of the sun “stands for the idea of goodness or ‘the Good’” in terms of reaching “completion of a person’s education because the mere knowledge of facts and concepts can still leave one at loss.” At some stage in the Cave Allegory, Socrates himself notes that the prisoners are “like ourselves,” and that the dark cave wherein the prisoners subsist equals our restricted “world of sight.” Ascending to the sun symbolises the “intellectual world,” and the right to use one’s own “reason” to act wisely in “public or private life.” That is what can lead to ensoniment and prevent unsound and ignorant behavior similar to that which led (on the part of the Athenian rulers) to Socrates’ execution.

One could liken Socrates’ cave to Verne’s previously mentioned concert hall. Although Verne holds a direct view into the hall, at least we know that Pianowski was absent from it in person. He merely technologically reproduced and broadcast his live performance to Amiens’ concert hall from the Paris Hertz Hall. For this broadcast situation, one can easily imagine how a large electric telescreen would have shown Pianowski’s distant arrival on the wall of Amiens’ concert hall. French science fiction writer Albert Robida (1882) illustrated, in Figure 9 further below, a large telescreen, naming it a “téléphonoscope.”[104] It is easy to imagine how the téléphonoscope casts moving shadows on the wall of the concert hall in Amiens from that scene, namely the roadway in the cave, where the puppet showmen used to hold objects in the air, make noise and visually and sonically manipulate the prisoners’ sensory perception. Pianowski’s distant images and sounds flow through the new medium of the téléphonoscope instantaneously into the global halls of Amiens, Paris, London, Vienna, Rome, Beijing, and St. Petersburg. In this manner Pianowski embodies the new 21st-century-puppet showman as an instrument of the broadcasting industry and its global machinery of distribution. Now consider how Bramann (2009) highlights another case of sonic heteronomy and the role of the audience portrayed as prisoners in “today’s media scene:”

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[104] Heinrich Raatschen (2005: 204) *Die technische und kulturelle Erfindung des Fernsehens in den Jahren 1877-1882*, PhD Thesis, Philosophische Fakultät, Heinrich-Heine-Universität, Düsseldorf.

> The image of Plato’s cave is strongly reminiscent of today’s media scene—particularly the situation created by motion pictures as the main medium of communication and entertainment. When movie theatres had the most dominant position in the entertainment industry, millions of people sat motionless in dark caverns, all mesmerized by the same shadows that moved across the big screens. And when television became the primary medium, people spent even more time as semi-hypnotized consumers of an endless stream of moving images and manipulative sounds. It is not far-fetched to see today’s television consumers as masses of mental prisoners who get their values and views of the world from the images and programs that powerful corporations or governments keep feeding into their minds. Most viewers are in no position to check what they receive from the screen against the facts of the real world. The world in which they live emotionally and cognitively is a television world, a world produced and explained by strongly manipulative information and entertainment industries. Like Plato’s chained troglodytes, viewers rarely even wonder whether what they see and think corresponds to reality or not. To a large extent they simply take what they see to be the world.[105]

Bramann’s passage conveys the idea of sonic heteronomy by recalling his earlier distinction between the “notion of things” versus “real things;” but it seems difficult to recognise the difference between them. How does one know that sound and images broadcast on screen match to real things behind? How does one know that the sounds and image are not fools of manipulation and collage? Maybe the sounds and images Pianowski’s audience receives in Amiens truly come somewhere from London, instead of Paris. Maybe the sounds come from Rome, and the images from Vienna. Another illustration of sonic heteronomy and this contrast between the “notion of things” and the “real things” demonstrates Verne’s earlier talk with the bizarre creature, a member of the concert audience, standing outside Amiens’ concert hall. Though Verne conceives the creature as a dilettante and native person with extraordinary ears, it emerges that this creature is an ensonified or enlightened creature. When it urged Verne to see and realise the meaning behind the big letters of the concert announcement "ELECTRIC," the creature actually wanted him to understand the distributed nature of the concert and the unique musical experience that Pianowski's body may dwell someplace else, although his music sounds in Amiens' concert hall. So the creature of the future was soundly knowledgeable of the real thing or what Murray Schafer would call the schizophonic truth. Instead, Verne was the ignorant one here who admitted his lack of knowledge about the effects of technological reproduction on the music culture of the future.

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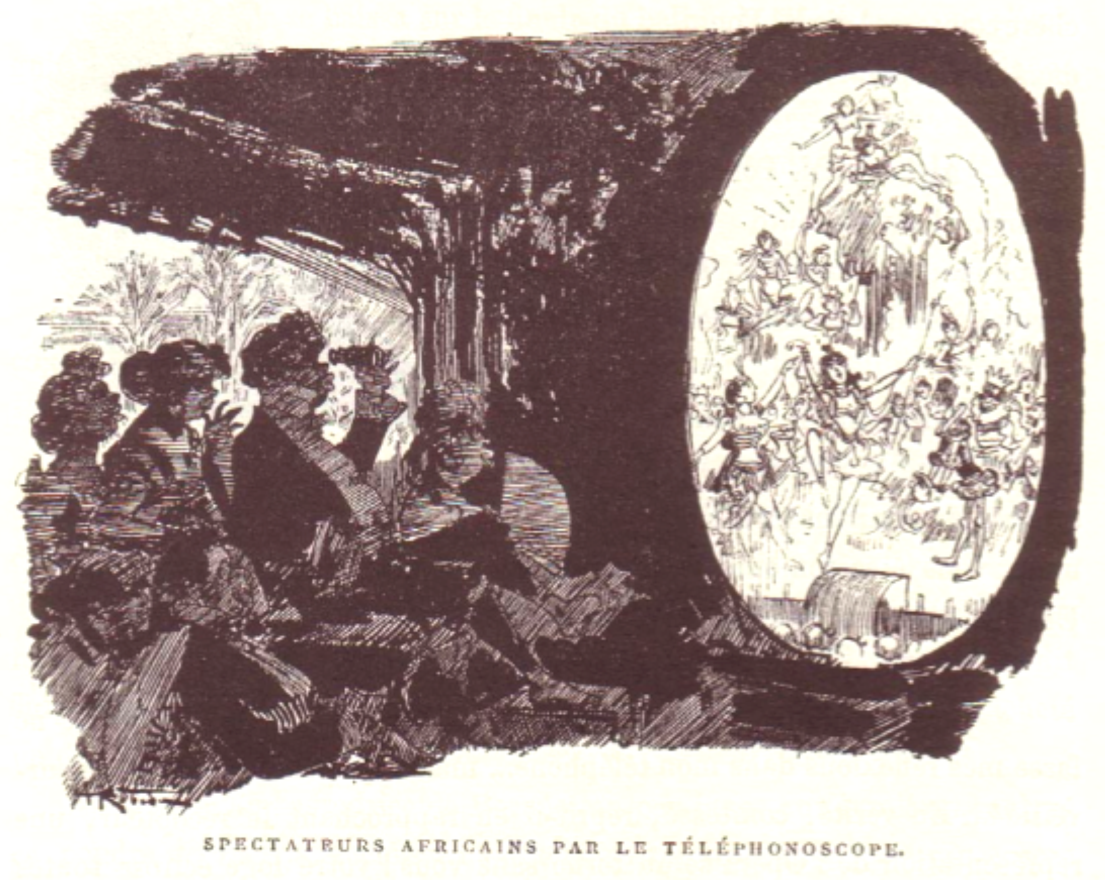
[105] Listen to Jorn K. Bramann and Dennis Merrill’s (2000) acoustic version of Plato’s “The Cave,” Department of Philosophy, Frostburg State University, Maryland, available at http://faculty.frostburg.edu/phil/forum/TheCave.htm (April 2012).


SPECTATEURS AFRICAINS PAR LE TÉLÉPHONOSCOPE.

[Fig. 9] Albert Robida's 1882 science fiction illustration of distant audiences in Africa watching local Paris entertainment on the téléphonoscope.[106]

Regarding the idea of sonic heteronomy and ensoniment, then, Plato's Cave tells us how powerful media corporations may condition human minds visually through shadows and also acoustically through sound reproduction. Plato's Cave relates to McLuhan's theory of visual and acoustic space because the theory assumes that Western human beings had already left the dark cave on their way towards modernity. In other words, they left behind unawareness, ignorance, or lack of knowledge in acoustic space, and advanced or progressed from the primitive tribal man in acoustic space to the sophisticated literary man in visual space. A threat to this progression of man, as in Plato's sense of enlightenment, McLuhan sees in the diffusion of new media technologies, for they may have the power to draw man back into the cave, like a fall back into preliterate or unenlightened existence. It is an existence where, instead of well-educated forms of reasoning, the immediacy of pure sensory impulses such as those of multidirectional acoustic phenomena in the local environment condition human life most of all. What happened in terms of sound locally inside the space of the cave, electronic media expanded globally into one large acoustic space.

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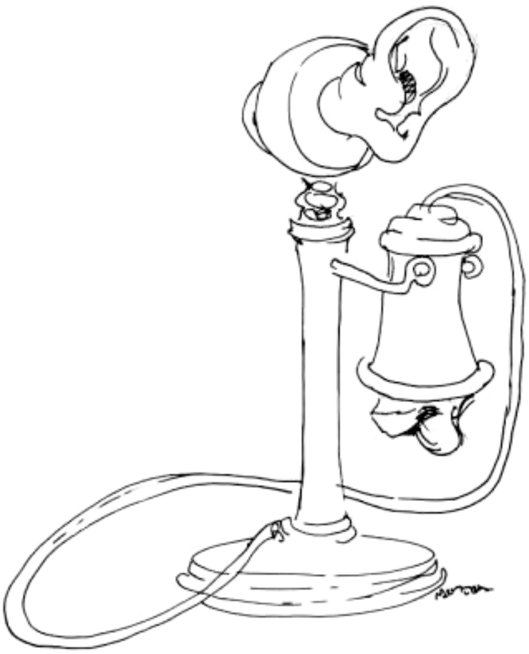
[106] Raatschen (2005: 204).

Besides McLuhan's media picture, Verne's aforementioned science fiction vision of future music—where new technologies would other-direct and determine human musical lives in sonic heteronomy—also relates to Plato's Cave. Compared to McLuhan, Verne's idea of media determination is less depressing or discouraging because Verne, similar to Plato, hints at a possible exit, a way out of the cave or Amiens, saying that the city of Amiens would be a "wise and serious city," just like Plato calls upon the people to be wise and use their faculty of reason to obtain enlightenment. Should Amiens want to master the new wave of future music wisely, as Verne might say, the city's people would want to think and listen carefully instead of shutting their ears and screaming like the subject of Edvard Munch's painting "The Scream." As Kant (1874: 485) argues, "a public can only achieve enlightenment slowly" like a delayed metamorphosis. The next section shows how Kant's idea of enlightenment relates to ensoniment and a self-directed and democratic exchange of musical creativity over telephone networks.

3.2. Sonic Autonomy



[Fig. 10] Real-time distant human interaction by telephone.[107]

3.2.1. Musica Telephonica: Early Network Jammers

Having considered Verne's, McLuhan's and Socrates' ideas about unenlightenment in relation to sonic heteronomy, the main question now becomes: "What is enlightenment?" In 1783, German pastor Johann Friedrich Zöllner posed exactly this question in the *Berlin Monthly* (*Berlinische Monatsschrift)*. He complained that "this question, which is almost as important as: 'what is truth' should be answered well before one would begin to enlighten! And yet I have found an answer nowhere!"[108] In Königsberg, Immanuel Kant welcomed Zöllner's question and replied to it in his famous essay "Answer to the Question: What is Enlightenment?" published shortly after in the *Berlin Monthly*, 1784. Reminiscent of the Cave Allegory, Kant answers that "enlightenment is man's release from his self-incurred tutelage." He explains that

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[107] Drawing by Dean Motter in Laureano Ralon's (2010) interview with "Eric McLuhan," *Figure Ground Communications*, available at http://figureground.ca/interviews/eric-mcluhan/ (April 2012).

[108] Author's translation from German as cited by Kant: "Was ist Aufklärung? Diese Frage, die beinahe so wichtig ist, als: was ist Wahrheit, sollte doch wohl beantwortet werden, ehe man aufzuklären anfinge! Und doch habe ich sie nirgends beantwortet gefunden!" in Prometheus Online, full essay available at http://www.prometheusonline.de/heureka/philosophie/klassiker/kant/aufklaerung.htm#SA (April 2012).

"tutelage is man's inability to make use of his understanding without direction from another," whereas "self-incurred is this tutelage when its cause lies not in lack of reason but in lack of resolution and courage to use it without direction from another." Dare to be wise, or, in Latin, Kant writes, "sapere aude! Have courage to use your own reason!—that is the motto of enlightenment."[109] Kant's idea of enlightenment is significant for the idea of ensoniment because it encourages self-directed and autonomous thinking and acting. It encourages a democratic, free and open exchange of sonic knowledge. It reminds us to be always self-assured and free in our own critical reflection. It reminds us to rise out of mental dependency and sonic heteronomy.[110]

To consider a musical situation, we will introduce early telephone operators as a historical example of sonic autonomy. In the late 19th century, telephone operators had a pleasurable time at night. They would freely and publically share "amusing stories," or play music "on a circuit of several stations."[111] That is what they played in one night, in 1891. Several telephone operators sat at their electronic switchboard stations in six different cities around New England. While four operators interacted long-distance among Boston, Worcester, Fall River, and Springfield, Massachusetts; the fifth joined the scene from a switchboard station in Providence, Rhode Island, and a sixth finally joined from New York City. Entitled "Concert Music by Telephone," *Boston Evening Record* (1891) recalls how "some tune will be started by the players." The "operator in Providence plays the banjo, the Worcester operator the harmonica, and gently the other sing" in musical telepresence. Although "one must have a transmitter close to his ear" to hear them perform at a distance, as the journalist notes, it "will sound as clear as though it were in the same room.[112] But it was not in the same room. Instead, the medium connected these individuals across three American states and six cities simultaneously.

What, then, does this early case of musical telepresence have in common with Kant's "motto of enlightenment"? Whereas Kant argues in 1784 that "our rulers have no interest in playing guardian with respect to the arts," nowadays, one can argue the opposite. The 20th century witnessed the materialisation of powerful media corporations that rule and guard the creation, propagation, and consumption of sonic art.[113] In the face of these industrial developments in sonic heteronomy, the above case of early musical telepresence or network music is important both because all participating telephone operators interacted sonically free with one another at a distance, and because they created and circulated media content on their own accord. In Kant's sense, these individuals had the courage to make use of their own musical understanding in the medium without any music industrial agents intervening, directing the action in form and content. The individuals were self-directed. As in regular telephony, most participants are in Kant's sense independent thinkers who actively determine their own conversation; similarly, the early telephone operators creatively determined their own musical conversation—not the medium or a media company. One could say the operator jam session was more than just an assertion of self; it was a self-directed and creative negotiation, an autonomous intervention, or subversion of the official or proper uses of an early telepresent medium of sound, the telephone.

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[109] Immanuel Kant (1784) "What is Enlightenment?" in ed. Paul Halsall (1997) *Internet Modern History Sourcebook*, Fordham University, New York, available at http://www.fordham.edu/halsall/mod/kant-whatis.html (April 2012). Note there exist different English translations of Kant's essay.

[110] Kant's essay is mostly about the emancipation or release from religious dependence in a strongly authoritarian age. See also Frank E. Manuel's (1965) chapter "Religion & Superstition" (43-69) with critical essays on religion by Hume, Rousseau, d'Holbach, and Lessing in *The Enlightenment*, Prentice-Hall, Englewood Cliffs, New Jersey.

[111] Carolyn Marvin (1988: 212) *When old technologies Were New:Thinking about Electric Communication in the Late Nineteenth Century,* Oxford University Press, New York.

[112] Cited in Marvin (1988: 212).

However, this early case of sonic autonomy happened at a time when telephone companies began to restrict and transform the open means of distant communication. Nothing but the role of the listener shows more that early telephony was "essentially a public medium;" as John Durham Peters (1999) clarifies: "Every call was placed with the aid of a human operator" because person-to-person connections were nonexistent, and "up to the 1880s there were no telephone numbers: operators simply used the names of subscribers to track the slots on the switchboard." Telephone companies started to establish "secure private channels of contact between unique addresses" only around 1900. Until those days, the "personal touch was omnipresent" (195) in an open telephonic space. As soon as people listened into a receiver, their individual ears became communal ears. The opening ceremony of an 1890 British telephone church service reveals the omnipresence of this experience. Frequently, telephone listeners were disturbed by "cries of 'Hello, there!' 'Are you there?' 'Put me onto Christ Church.' 'No, I don't want the church.'"[114] Similarly, in 1888, after a long-distance violin concert between Connecticut and Philadelphia, people could hear the telephone audience's applause in the network "from six or seven places along the line."[115] At the very moment of their applause, the audience's listener role transformed into that of a telephone performer. As playwright Bertolt Brecht later sought to restore the one-way channels of radio into two-way channels: "listeners shall become players."[116] Early telephone networks were just too radically open and interactive a two-way sound technology back then.

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[113] See also Ben H. Bagdikian (1983) *The Media Monopoly*, Beacon Press, Boston. On music, Robert Burnett (1996) *The Global Jukebox: The International Music Industry*, Routledge, London and New York.
[114] Marvin (1988: 215).

Today, suppose one would change Zöllner's aforementioned question, "what is enlightenment?" and ask instead, "what is ensoniment?" One could answer that the idea of ensoniment suggests, in Plato's and Kant's sense, a release from the fetters of sonic heteronomy. It implies largely self-motivated and self-directed people who think, organise and take sonic action among themselves, for instance, in what network artist Álvaro Barbosa (2006) calls "shared sonic environments." They draw on the publically "most disseminated and open technology" available where people can democratically experience the "distributed and shared nature of the Internet" (41-69).[117] Musical telephone operators in the late 19th century represent a neglected pioneer of the people in these environments. Telephone operators already experienced the distributed and shared nature of early electronic networks. Probably without being aware of it, they heralded the future and the innovative and creative use of electronic networks for distance music—similar to what became, to a degree, programmatic or systematically organised about a century later. I mean those distributed musical practices of The League of Automatic Music Composers and The Hub using, among others, personal computers and telephone networks as their instruments of musical expression along with new telecult values and a clear aesthetic understanding of their music as "network music." The next section portrays how radically autonomous and free of external direction these bands were, as they created their unique sounds within the network medium.

3.2.2. Trust Thy Sound: The Hub

"Were I the type to place bets on history," musicologist and concert attendee Kyle Gann writes in "Musica Telephonica" (1987), "I could see The Hub as the beginning of a very important movement" (83) for the music of the future. On June 6-7, 1987, the unique American computer network band The Hub (which had evolved from The League of Automatic Music Composers (1978-1982)), caused a sensation during their distributed New York City concert. Unlike usually jamming their improvisational computer music over local electronic networks in the same acoustic space, the group split and played together at a distance from two distinct performance spaces instead. While three group members, Chris Brown, Scot Gresham-Lancaster and Phil Stone played at the city's Clocktower location, John Bischoff, Tim Perkis, and Mark Trayle simultaneously joined from ten blocks away at the Experimental Intermedia Foundation. All six individuals interacted in musical telepresence over the city's telephone network as though they were in the same room.[118]

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[115] Marvin (1988: 211).

[116] Author's translation from German: "Hörer sollen zum Mitspieler werden."

[117] See Barbosa's network installation Public Sound Objects, available at http://www.abarbosa.org/pso/timeline.html. Also, Byeong Sam Jeon's Telematic Drum Circle, available at http://www.telematicdrumcircle.net/ (April 2012).

What do The Hub's network musical practices have in common with the idea of sonic autonomy, trust, confidence and reliance as the above chapter section title suggests? To begin to answer this question, I will relate Kant-inspired philosopher Ralph Waldo Emerson in his essay "Self-Reliance" (1841), to artists Chris Brown's and John Bischoff's essay "Computer Network Music Bands: A history of The League of Automatic Music Composers and The Hub" (2005). (For purposes of clarity, I will write mostly "The Hub" instead of using both band names each time.) At first it may seem incongruous to compare the shared musical creativity of The Hub to Emerson's individualistic philosophy.[119] Yet it is this seeming incongruity that focuses the following discussion on whether these two supposedly conflicting ways of thinking share ideas and inform the understanding of sonic autonomy.

Note in the discussion a possibly misunderstood subtlety in the use of the word "self." With "self" as in self-direction, self-reliance or self-determination, I do not mean that particular "self" stemming from the French philosophical tradition, following for the most part a psychological or psychoanalytical line of reasoning. "French version of the self" alludes to how Kant's thinking evoked two major strands in the history of philosophical thought: the analytic tradition based on reason and logic with, among others, Frege, Russell, Wittgenstein and, on the other hand, the continental tradition with post-structuralism going back to Hegel and German Idealism, and Existentialism with Kierkegaard, Kafka and Sartre; and also Marxism. Considering the "French self," post-structuralism is largely a French tradition that combines the idea of the oppressive capitalist system with alienated individuals (coming from Marx) with psychoanalysis of the disordered, neurotic or schizoid self (coming from Freud). That is what I mean by "French version of the self"—the institutionally oppressed and psychologically 'ill' self.

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[118] See a video excerpt of The Hub's "The XI Clocktower Concert Live" (1987), available at http://www.youtube.com/watch?v=qYQoImA1YlA&feature=plcp (September 2012).

[119] On a related critical note, see Christopher Newfield (1996) *The Emerson Effect: Individualism and Submission in America*, The University of Chicago Press, Chicago.

But, "self" can also be understood abstractly as a generalised subject.[120] This "self" as in self-reliance and self-determination is not limited to the psychological self. Just as it can refer to self-determined nations, so too it may refer to self-determined individuals or groups of individuals who practice collective musical creativity autonomously at a distance—who are doing, in a sense, their own thing on electronic networks. Sonic autonomy has at its core idea a self-determined, self-reliant, free, liberated or independent "self" in the context of music and technology.

Despite their seemingly opposing ways of thinking, Emerson on the one hand and Brown and Bischoff on the other, resemble one another in some ways. Both are American pioneers—one in philosophy, the other in electronic music. Emerson's thinking idiosyncratically and unconventionally fuses a Kantian rational, calculated, engineering-type logic or reasoning with a romantic way of thinking, putting emphasis on the awareness of the moment, intuition, inspiration, and feeling. Similarly, The Hub's thinking comes from very calculated, mathematical, cybernetic roots. Some of the band members were engineers who tinkered and created their own electronic circuitry and networks as a means of musical expression—a phenomenon Thom Holmes in *Electronic and Experimental Music: Technology, Music, Culture* (2008: 227) refers to as "circuit tinker community." The Hub's musical expression stems ideologically from the 20th-century romantic way of life, that is, the hippie culture of the 60s and early 70s. Like Emerson, The Hub also emphasised the awareness of the moment, intuition, inspiration, and feeling for their musical improvisations on networks.

Similar to Kant's earlier-mentioned take on the importance of enlightenment, autonomy and self-direction, Emerson's essay "Self-Reliance" also (1841) criticises external authorities—though more radically than Kant does. Emerson criticises not only the rulers of the church, but condemns thoroughly all sorts and forms of heteronomy, dependence and obedience on such external authorities and the mainstream culture. Institutions, social establishments, and traditionalism may all conform the unique thinking and acting of individuals into predetermined, unified rails of thought. “Our arts, our occupations, our marriages, our religion we have not chosen, but society has chosen for us. We are parlor soldiers” (42), Emerson proposes. “Insist on yourself; never imitate.” Always offer “your own” talent “with the cumulative force of a whole life’s cultivation; but of the adopted talent of another you have only an extemporaneous half possession” (46). In other words, individuals should do their own thing and refuse to adopt or assimilate against their will to the social and cultural masses. Emerson shared these ideas with a group of thinkers called the New England Transcendentalists. They strongly believed in what Bramann (2004) encapsulates as the “creative intuitions of thinking and acting individuals.”[121]

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[120] See Robert Hanna (2004) *Kant and the Foundations of Analytic Philosophy*, Oxford University Press, New York.

In comparison, The Hub’s thinking and acting sounds quite different. Brown and Bischoff (2005) stress that the group as a whole is more important than the aura of an individual performer. A communal idea of network music-making is the philosophy the band follows. Brown and Bischoff illustrate this philosophy in music historical perspective. Since the beginning of the Renaissance in the 14th century, they propose, music in the Western World amounts to “primarily a celebration of the individual as genius: composer, virtuoso, rock star.” Yet, the individual musician plays a minor role in “Southeast Asian gong music traditions, like Javanese gamelan,” or Buddhist drumming, where an important “focus is the group, and individuals strive to blend seamlessly and anonymously within it.”[122] Brown and Bischoff stress that The Hub’s network musical practices resemble more Southeast Asian gong music traditions than Western music traditions celebrating individuals. Though The Hub’s music is “created by individuals,” the band’s focus lies, “not on individual personalities, but on the cultural macroorganisms revealed in their interaction” (374). During their distributed live performances, The Hub can therefore transcend the “physical boundaries of individuals” (373) for the aura of the whole community.

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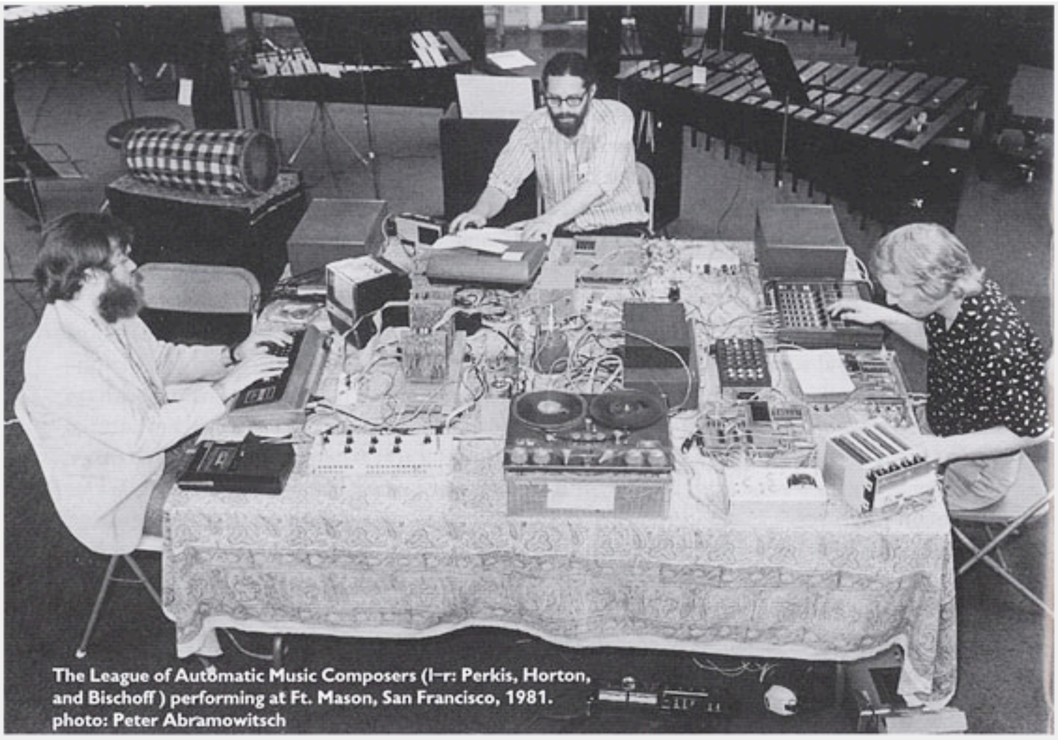
[121] Jorn K. Bramann (2004) “Emerson: On Living Here and Now,” Department of Philosophy, Frostburg State University, Maryland, available at http://faculty.frostburg.edu/phil/forum/Emerson.htm (April 2012).

[122] Gil Weinberg writes on Gamelan and network music (2003: 21-2) *Interconnected Musical Networks - Bringing Expression and Thoughtfulness to Collaborative Group Playing*, PhD thesis, Program of Media Arts and Sciences, Massachusetts Institute of Technology.



The League of Automatic Music Composers (l–r: Perkis, Horton, and Bischoff) performing at Ft. Mason, San Francisco, 1981.
photo: Peter Abramowitsch

[Fig. 11] The League of Automatic Music Composers, Fort Mason Centre, San Francisco, 1981.[123]

However, there are similarities between The Hub‘s communalism and Emerson’s individualism, noticeably how Emerson and The Hub put emphasis on the notion of spontaneity. For Emerson, spontaneity is strongly fundamental to human nature. As he puts it, “spontaneity or instinct” is the “essence of genius, of virtue, and of life” (36). Spontaneity implies for Emerson to live a life in the here and now, to be aware of one’s thinking and acting in the present. “Be it how it will, do right now” (34). Similarly, for the The Hub spontaneity constitutes a key influence in their idiosyncratic network music. Remember, they were among the first bands who “approached the computer network as a large, interactive musical instrument” to spontaneously and instinctively jam and create “a music that was noisy, surprising and often unpredictable” (375). Due to each performer’s deep musical immersion and spontaneity on electronic networks, the whole group’s aura had a “distinctly improvisational character.” That is why their live performances sounded “always different in its detail” (381). Spontaneity is, therefore, what unites both the communalist and individualist ideas into one nonideological human behavior.

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[123] Modcult (2007) “The League of Automatic Music Composers,” available at http://modcult.org/read/2007/12/29/league-of-automatic-music-composers (April 2012).

Besides spontaneity, another similarity between The Hub and Emerson is their reluctance to join mainstream culture. "Whoso would be a man," Emerson raises, "must be a nonconformist" (29). Though Emerson is well aware that "for nonconformity the world whips you with its displeasure" (32), he complains that "society" would be like a "joint-stock company, in which the members agree, for the better securing of his bread to each shareholder, to surrender the liberty and culture of the eater." Emerson warns that such a culture produces a culture of "conformity" (32) or a culture of heteronomy. Similarly, The Hub were unwilling to conform to mainstream culture. Instead, their roots in The League of Automatic Music Composers extend to the "countercultural revolutions" in the 1960s and 1970s, and a telematic future music that was autonomous and "defiantly noncommercial."[124] Brown and Bischoff remember that an audience in this noncommercial culture was "diffuse," and presented only "futile" career opportunities. So the group chose to invest their "efforts following the potential of fantastic ideas, rather than worrying about the practical applications of those ideas within traditional musical domains" (375). In other words, what gave the band a highly individual style was its nonconformist musical behaviour in sonic autonomy.[125]

Noteworthy about The Hub is their striving for sonic autonomy. Undressed from the cultural garb of hippie communes and Southeast Asian gong traditions, a strong nonconformist or autonomous spirit in the music becomes apparent. It is an American inventor spirit in the form of cybernetic pioneers in computer network music, partly using telephone networks. Musicologist Gann earlier called The Hub's music "musica telephonica." It perfectly defines the band's innovative and technological capacity particularly if we consider the historical background or origin of the term "musica telephonica." It stems from Roman philosopher Boethius' in *De Institutione Musica,* where he distinguishes musica mundana—a world soul that animates the movements of the celestial spheres, musica humana—an immortal soul related to the ephemeral human body, and musica instrumentalis as the only real audible music, created by individuals with musical instruments.[126] My point is that The Hub, in a sense, electronically extended Boethius' notion of musica instrumentalis into that of musica telephonica. Unlike other bands at that time, The

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[124] Scot Gresham-Lancaster (1998) outlines the tradition and "History of Experimental Music in Northern California," in *Orima*, available at http://www.o-art.org/history/index.html (April 2012).

[125] The band's musical nonconformism becomes clear in this rare video footage of the "League of Automatic Music Composers Live" (1981), available at http://www.youtube.com/watch?v=CBaqvFDHCBY (April 2012).

[126] Max Peter Baumann (2000) "Zur Anthropologie der Musik," Ethnomusicology, University of Bamberg, Germany, available at http://maxpeterbaumann.de/Anthropologie (April 2012).

Hub already used computers and telephone networks, as their main instruments of distant sonic expression.

It has become clear that what distinguishes The Hub from traditional forms of musical expression—that is, the unpredictability, spontaneity and shared, collabortive nature that many types of music contain—is that The Hub did not use traditional musical instruments. They were early musical adopters of computers, self-built electronic circuitry, sound generators, and other technological equipment hooked up to electronic networks. Though the group's inner dynamics promoted democratic decision-making or collective music making over electronic networks, the group as a whole was striving for individuality and sonic autonomy. Brown and Bischoff identify their own network artistic practices as a form of "creative anarchy" in the sense of a "new form of chamber music" (383). If we suppose Emerson would have listened to The Hub's distance music at their earlier-mentioned New York City concert, he might have said that this group of electronic anarchists must be truly driven and convinced of their artistic validity to perform such nonconformist sound in public at all.[127] "Trust thyself; every heart vibrates to that iron string." Emerson's words (1841: 27) would go straight to the heart of The Hub's motivation for self-reliance and sonic autonomy.

3.2.3. The Inevitable Impulse: Human Motivation

Architect Paul Schneider-Esleben (father of Kraftwerk cofounder Florian Schneider) in a sense, hints at The Hub's creative impulse of sonic autonomy. Speaking figuratively, he said, "Anyone who swims with the current will reach the big music steamship; whoever swims against the current will perhaps reach the source."[128] Similar to Emerson above, Schneider-Esleben states that conforming to the flow of the mainstream is much easier for those involved, than performing "against." However, a question is what makes network bands like The Hub struggle against the stream of the "big music steamship" and strive for sonic autonomy in the first place?

We can approach this question using a psychological model of subjectivity in human motivation. Motivation is generally defined as an "internal state that arouses, drives and directs behavior that have been accounted for by physiological explanations."[129] Behavioral psychologists including Richard Ryan and Edward Deci (2002) or Jutta and Heinz Heckhausen (2010) distinguish human motivation in two key concepts they call "extrinsic motivation" and "intrinsic motivation."[130] As the name implies, extrinsic motivation means that someone is being motivated from the outside—when certain external impulses determine the musical activity, rather than the impulse coming from the enjoyment of the activity of music-making itself. Extrinsic motivation distinguishes furthermore, punishment and reward-based modes. Suppose the earlier mentioned Pianowski could broadcast his electric concert from the Paris Hertz Hall somewhere only because the Emperor of the Sandwich Islands would otherwise reject Pianowski's distant musical services. In this case, the emperor would be using punishment as leverage to motivate the artist externally. Similarly, if the earlier musical telephone operators in New England had performed their network music only because their employers at the switchboard station had offered them a salary increase, then the employers would have been using a reward-based enticement to motivate the operators externally. The same would apply to The Hub, if they would have played in New York City only for a possible record deal from a respected avant-garde label. Regardless of whether external motivation is reward- or punishment-based, both modes of external motivation involve, in Kant's and Emerson's sense, others to intervene or direct one's own thinking and acting.

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[127] Electronic music composer Klaus Schulze once stated in an interview on 1970s krautrock that you had to be "convinced of yourself" to play such nonconform music live on stage. Interviewed by guitarist of Porcupine Tree Steven Wilson, in *Rheingold: Live at the Loreley* (2008), Synthetic Symphony, 239 min., Germany.

[128] Cited in former Kraftwerk drummer Wolfgang Flür (2003: 13) *Kraftwerk: I was a Robot*, Sanctuary, London.

Conversely, the other psychological idea one could use to understand the origins of musical creativity is intrinsic motivation. As the term already suggests, here the main stimulus to act comes not from outside, but from within oneself in the sense of self-motivation. However, analytical reverse engineering and seeking for the origins of such internal stimulus in music-making resembles a deep-sea expedition into the depths of the self. Psychoanalysts would probably see the origins of self-motivation in sublimation: Human beings possess a creative force, acclaimed among Freudians as libido or lust that is always present, always trying to act out in terms of reproduction, and in many other ways too. Whereas in art-making the author lives out her creative force as the author on paper, the painter in the picture, the musician in the melody, others again live it out collecting garden gnomes or classic cars. In quest for recognition and acknowledgement, their creative force finds its course like water.

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[129] ITS Psychology Dictionary, available at http://www.tuition.com.hk/psychology/m.htm (April 2012).

[130] Edward L. Deci and Richard M. Ryan (1985) *Intrinsic Motivation and Self-Determination in Human Behavior*, Plenum Press, New York. See also Sansone and Harackiewicz *Intrinsic and Extrinsic Motivation: The Search for Optimal Motivation and Performance*, Academic Press, San Diego. Also, Ryan (2002) and Heckhausen (2010).

Various creative achievements seem to come into play in this way. Also in network music, self-motivation may be rooted in sublimation, triggering then what a performer may notice as a creative impulse or inspiration from inside.

Writing on networked performance, sound artist and technology scholar Álvaro Barbosa (2006) puts the subject of musical creativity in a different way. With respect to psychologist Mihály Csíkszentmihályi's ideas on what he terms an "autotelic experience" (self-fulfilling experience) of the "creative person," Barbosa suggests two categories of creative people in distance music: experts and non-experts. Barbosa sees the experts in computer music and network technology, leading "innovative creation" as opposed to the users being the non-experts in "search of aesthetic and creative pleasure" (20). Yet one could oppose Barbosa's take on networked creativity and stress with respect to intrinsic and extrinsic motivation that musical creativity reaches beyond the two groups of technology experts and pleasure-seeking users. It goes deeper than the actual activity and enjoyment of network musical expression.[131] On the other hand, the outlined psychological model of intrinsic and extrinsic motivation also involves a problem of a blurred division between the two concepts. This problem becomes apparent if we take into account the following non-musical but popular literary situation in Stephen King's novel *Misery* (1987: 45). When protagonist Annie Wilkes tries to push author Paul Sheldon into burning the only existing copy of his latest book, Paul vehemently opposes. He tries to turn the tables:

> "*You* burn it, then!" he yelled at her.
> She turned and looked at him.
> "No," she said, "I cannot do that, as much as I would like to and spare you the agony you feel."
> "Why not?"
> "Because," she said primly, "you must do it of your own free will."

In this passage, King indirectly plays, among others, with the concepts of extrinsic and intrinsic motivation. Though Paul is Annie's prisoner, and she could easily force him to burn his writing immediately, she first tries to motivate Paul in a punishment-based mode. However, at the same time she expects Paul to burn his writing of his own free will or out of his own intrinsic motivation. What King's strange case shows is that the psychological model of subjectivity (extrinsic and intrinsic motivation) tries to understand in fact obscure and inextricable human forces in real life and the activities of a creative person. In other words, these forces of human motivation, along with creativity based on sublimation and self-fulfilling experiences, fuel and drive the creative endeavours of networked performers to act autonomously at a distance. This would fulfill Schneider-Esleben's above definition of nonconformity and autonomy "against" the stream of the "big music steamship."

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[131] Irène Deliège and Geraint A. Wiggins provide an edited chapter on "Creativity in Musicology and Philosophy of Music" (7-61) in *Musical Creativity: Multidisciplinary Research in Theory and Practice,* Psychology Press, New York. On creativity in music write also Toynbee (2000), Warner (2003), Sterne (2006: 256), Tschmuck (2006: 179-251), Tanaka/Tokui (2006: 1-8). A system analytical account on creativity provides Csíkszentmihályi (1999: 313-39).

Discussion

This chapter has critically considered Jonathan Sterne's (2003) discussion on Ensoniment. He understands the term Ensoniment largely as a historical classification in the sense of the Age of Enlightenment, whereas I understand the term as the *idea* of ensoniment in the sense of the early philosophical idea of enlightenment. If we again raise the question from the beginning of this chapter, "what is ensoniment?" then we could answer that the term now implies both: on the one hand, the Age of Ensoniment and, on the other hand, the idea of ensoniment. Like the idea of enlightenment, the idea of ensoniment refers to liberation, emancipation, or empowerment of human beings from some form of sonic dependency, a development which I portrayed as a move from sonic heteronomy to sonic autonomy. To put it succinctly, my idea of ensoniment hints at a shift in thinking about the relationship of human beings and sound media, from media determination to human self-determination in media.

Plato, McLuhan, and Verne all portrayed various shades of sonic heteronomy. Whereas Verne saw the main cause for sonic heteronomy in the advance and success of electricity from the late 19th century onwards, McLuhan transcended the old critique of electricity, seeing the cause for sonic heteronomy in the propagation of new media in the late 20th century instead. Socrates told us how sonic heteronomy works even without electricity and media. Simply the visual and acoustic events of moving shadows and echoing sounds in a cave can utterly manipulate individuals' lives. Socrates' image of the cave resembles modern shades of sonic heteronomy, such as in North Korea where every home represents an electronic cave with an externally operated or centrally controlled loudspeaker system that turns on automatically for political propaganda.[132] The utility of Plato's Cave for today's implications of sonic heteronomy becomes apparent if only we recall Shawn Fanning of Napster, Julian Assange of WikiLeaks or Edward Snowden who made information or knowledge available on the Internet unlawfully to millions of people. In Socrates' sense, Fanning, Assange and Snowden embody liberators, trying to enlighten and release the ignorant masses from their fetters of sonic heteronomy. Whereas to the dominant rulers Fanning and Assange are the offenders who do not subject themselves to the prevailing dogma and thus face prosecution, as Socrates did for his teachings in Athens. Sonic heteronomy does not mirror an open and democratic exchange of ideas. It presupposes a closed system of belief with false telecult values where powerful bodies technologically reproduce and mass distribute predetermined content for the altar in the living room, as the modern equivalent of Plato's cave.

However, "if one cuts the bonds on a man's hand" and releases him from the the cave, as former East German Minister of Culture Hans Bentzien informs the notion of sonic autonomy, "then the man can act freely."[133] That is how some network artists interacted during the time of the Cold War among the cities of Berlin, Vienna, and Budapest on April 15, 1983. Trying to "create a common space" or acoustic space "for artists across the ideological barriers that divided Central Europe at the time," one artist notes, "we simply connected our telephones to amplifiers and played live music to each other for a couple of hours" in telepresence.[134] In Kant and Emerson's understanding of enlightenment, one could say that these network artists acted in sonic autonomy; they had the courage and confidence to create their own sound across political borders. "Do not follow the ideas of others"—as on a related note Japanese Buddhist Dōgen Zenji (1200-1253) predated Kant's and Emerson's ideas on autonomy—"but learn to listen to the voice within yourself."[135] To create music with such inner voice on electronic networks as well as the inner voice of electronic networks, human beings need to first have the right motivation and purpose to confidently and self-reliantly direct or determine their own creative situation in the medium.

Critics might object to sonic autonomy, saying, that humans would be dependent on the medium rather than being independent. That may be true, but if artists want to play music at a distance, they need a medium to connect the performers. For them, media technology is, therefore, a prerequisite—like a harp for the harpist, or print media for the literary man. It is man and media together. A question beyond the precondition of the medium for sonic autonomy is whether individuals can be autonomous at all. It seems that total autonomy is an ideal construct. Human beings always depend on something, such as food and water as essential for survival; and something always manipulates their sensory perception, such as reading glasses or hearing aids. Even the most daring hermit or escapist, living in the deepest woods without electricity and running water, is fully dependent on the forces of nature. Atmospheric conditions of sun and rain rule his life. My point is that one cannot take the notion of sonic autonomy in the strictest sense of a total autonomy that would, if ever, come only with death. Instead, sonic autonomy follows a moderate idea of independence for which I contrasted self-directed versus other-directed humans in sound media. Though we rely on media to interact in sonic autonomy, yet we seem largely free to choose with whom we want to interact and what sounds we want to share over the medium. In a sense, we are free to choose how to fill an empty medium at a distance.

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[132] Writer Steven Hendryx (1982) uses the phrase "electronic cave" in "Socrates Revisited: Allegory of the Electronic Cave," in *InfoWorld*, vol. 4, September 27, pp. 27-8.

[133] Author's film transcription and translation from German: "Wenn man einen Menschen, dem die Hände gefesselt sind, die Fesseln durchschneidet, dann kann er sich frei betätigen." In Daniel Berlin's (1991) documentary film *Ost-Fernsehen* on the history of GDR television, Deutscher Fernsehfunk, 21 Dec. 1991, 124 min., Germany.

[134] Robert Adrian in "Art and Telecommunication, 1979-1986: The Pioneer Years," available at http://telematic.walkerart.org/overview/overview_adrian.html (April 2012).

[135] Igor Kononenko and Irena Roglič Kononenko (2010: 174) *Teachers of Wisdom*, RoseDog Books, Pittsburgh.

Along the way, I showed that the origins of sonic autonomy reach beyond the history of computer networks. A recent example that correctly portrays these origins is the science fiction movie *The Matrix*. For protagonists Neo and Trinity, a vital and liberating media technology represents not just the image of the modern computer, but instead the repeated metaphor of the archaic telephone and the telephone jack as key technologies to connect to the Internet. What the generally credited pioneers of network music and the new musical interaction paradigm The League of Automatic Music Composers pioneered in the 1970s was network music by computers. But the original, archetypal practice of network music embodies the forgotten telephone operators. They spontaneously collaborated and immersed themselves in musical telepresence nearly a century before The League. As Sterne (2003: 194) agrees, "even impromptu jam sessions among late-night operators could occasionally be heard over telephone lines by the mid-1880s." Yet it remains a mystery why, besides perhaps sound quality issues in the mid-range frequencies, telephon music remained mostly inconspicuous a development at least until the advent of the Internet and mobile telephony a century later.[136]

At the end of Kant's (1784) essay on enlightenment, he poses the question, "Do we live in an enlightened age?" His answer is, "No, but we do live in an Age of Enlightenment." His answer is similarly applicable to the world of digital sound and the cultural diffusion of virtual musical instruments today (see chapter 5). Only in an enlightened age of the future would everyone eventually engage in sonic art—like science fiction writer Ernest Callenbach envisions in *Ecotopia* (1978), where ordinary people "do not leave the practice of arts to professionals; instead, they are all engaged in this field."[137] In Callenbach's sense of a sonically enlightened future, I would disagree with Sterne's earlier claim that there "was" a period of Ensoniment sometime ago. Instead, we still live in an Age of Ensoniment. Every day we realise the idea of ensoniment a bit more. The following chapter gives empirical examples of this for one particularly unique historical case in the transformation of music culture and technology—telephone music, and the creation of a new musicsphere in the late 19th century.

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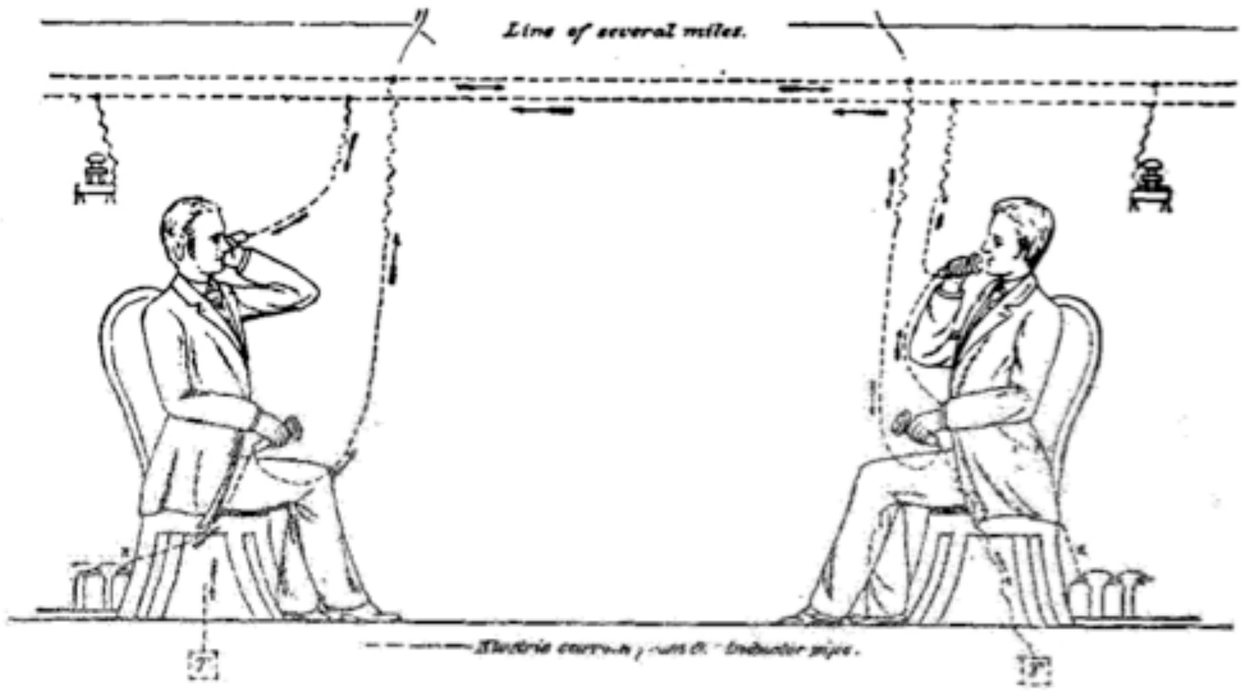
[136] Stefan Münker and Alexander Roesler (2000) provide essays on the telephone as the "most inconspicuous" and "underestimated means of communication of the present" in *Telefonbuch—Beiträge zu einer Kulturgeschichte des Telefons*, Suhrkamp Verlag, Frankfurt. See also Ulla Autenrieth and Andreas Blättler (2011) *Dis Connecting Media: Technik, Praxis und Ästhetik des Telefons: Vom Festnetz zum Handy*, Christoph Merian Verlag, Basel, Switzerland.

[137] Karl Traugott Goldbach (2005: 238) "Utopian Music: Music History of the Future in Novels by Bellamy, Callenbach and Huxley" in *Utopia Matters: Theory, Politics, Literature, and the Arts*, eds. Fátima Vieira and Marinela Freitas, Editora da Universidade do Porto, Porto, Portugal.

4. Case Study: The Conundrum of Telephone Music


Line of several miles.

[Fig. 12] Early Telephony: Artist Nestore Corradi's 1883 recreation of the original 1858 illustration for telephone inventor Antonio Meucci.[138]

The past lives selectively in the present … I try to illuminate the present by excavating several past moments with which I believe it has an affinity.

John Durham Peters, *Speaking Into the Air* (1999: 3)

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[138] Garibaldi-Meucci Museum, Staten Island, NY. Reproduced in Angelo J. Campanella (2007) "Antonio Meucci, The Speaking Telegraph, and The First Telephone" in *Acoustics Today*, vol. 3, iss. 2, pp. 37-45.

Introduction

The past of telephone music poses a mysterious conundrum. To unravel the mystery one needs first to understand the historical setting from which most present forms of sound transmission and storage media evolved as one single medium in the past: telegraphy. From telegraphy evolved phonography, a long-term memory, freezing and releasing music at pleasure from wax cylinders, gramophone records, CDs or MP3s, for example. On October 5, 1888, a phonograph committed to memory the human voice of British composer Sir Arthur Sullivan, telling inventor Edison: "[I am] astonished at the wonderful power you have developed, and terrified at the thought that so much hideous and bad music may be put on record for ever."[139] Besides phonography, telephony and radio also evolved from telegraphy. Radio and telephony, however, give us something fleeting or ephemeral, and not permanent like phonography.[140]

Both radio and telephone embody sound transmission media. But why has radio developed into a dominant music transmission medium, whereas the "telephone," as Emily Thompson states in *The Soundscape of Modernity* (2002), "remained a device for person-to-person conversation" (237)? It has become a common way of thinking that music transmission began with radio around the 1920s—a thinking that this chapter will counter, showing that commercial music transmission began by telephone at least one human generation earlier in the 1890s.[141] Yet from the historical aspect of the media it remains unclear why telephony and its electronic networks needed more than 100 years to be rediscovered as a popular vehicle of music transmission today. As art and media historian Dieter Daniels states in his book *Art as Transmission: From Telegraphy to the Internet* (2002), the past of telephone music "still belongs to the mysteries of media history" (88).[142]

What happened in this mysterious history of music transmission? What are the reasons for the bias in media theory to ignore telephony as a music transmission medium? Music technology scholar Simon Emmerson in *Living Electronic Music* (2007) names “frequency response and distortion” (143) as limitations of telephone music. Besides these potential sound quality issues, the most significant issue is that telephone music supposedly remained accessible only to specific audiences. Carolyn Marvin in her chapter “Implementing the Future: Performances by Wire” (1988) argues that these audiences “were small” in quantities compared to later radio audiences, and that telephone audiences were minority cultures of the “idle rich, not the humble poor” (223). “Efforts to reach extended audiences by telephone required elaborate logistical preparations. Its application to entertainment, therefore, remained experimental and occasional” (209). Adopting Marvin’s position, Jonathan Sterne in *The Audible Past* (2003) historically classifies telephone music as a phase of “experimental media systems”—their electroacoustic sounds aimed only at the “middle and upper class” (191). Put differently, Marvin and Sterne grant privilege to the masses, favouring radio over telephone transmission.

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[139] Lars Nyre's (2008) chapter section "On record forever" (192-5) provides a transcript of Sullivan's full speech in *Sound Media*, Routledge, New York.

[140] See Michael Chanan's (1995) chapter "Polyhymnia Patent" (37-54) explaining how sound storage and transmission relate to telegraphy.

[141] Systematic musicologist Helmut Rösing (1984) locates the onset of music transmission to the beginning of radio in "Listening Behaviour and Musical Preference in the Age of 'Transmitted Music,'" in *Popular Music*, vol. 4, pp. 119-49. See also Blaukopf (1989), Smudits (2002) and Kerlen (2003: 181).

[142] Author's translation from Daniels' German book title: "Kunst als Sendung: Von der Telegrafie zum Internet." Quote: "gehört noch zu den Rätseln der Mediengeschichte."

This chapter challenges Marvin and Sterne’s position on telephone music. I do not consider that Marvin and Sterne are trying to reinforce class categories in their assertion on the development of the medium. As critical scholars, they argue legitimately that certain socioeconomic class differences affected the ‘uptake’ of telephone music. However, I maintain that these class differences and inequities in power and access to telephone music are not the only factors in the medium’s development, even though they are significant. What I argue is less a critique of Marvin and Sterne on social class but that the influence of Marvin and Sterne’s work leaves telephone music somewhat marginal(ised) in the histories of media and music transmission. My point relates to Marvin and Sterne’s histories on mass uptake of media, and the way these thinkers’ emphasis on social class obscures the history of telephone music.

Already before the turn of the 20th century, telephone music ceased being experimental. It left the laboratories of inventors and entered a different realm—that of business interests. To name a few, Paris’ Compagnie du Théâtrophone, London’s Electrophone Limited, and Telefon Hírmondó in Budapest—were launched as new media start-up companies before 1900. They offered a wide range of commercially scheduled telephone programs: among others, news and entertainment transmissions of sport and church events, theatre, and musical performances. Telephone music was an early consumer media phenomenon partially within early corporate research and development. It was not a phenomenon that called for broad dissemination of the medium and music, as was the case with broadcast radio decades later.

To retrace the development of telephone music, this chapter draws on social scientists Herbert Kubicek and Ulrich Schmid's model of media diffusion in their article "Everyday Life Information Systems as Media Innovation" (1996: 6-44). It suggests three ideal-typical phases of media diffusion: a new medium's phase of "cultivation," then its phase of "differentiation and formalisation," and finally its phase of "infrastructural diffusion."[143] In what follows, I will briefly summarise each of these phases relative to the development of early telephone music from 1870 to 1900, one phase for each decade.

First, the cultivation phase of a new medium involves technology-centred cultures. Its protagonists have in common a similarly specialised scope of knowledge and work experiences. In pre-telephone music, the cultivation phase involves a certain technocultural context within small groups of people around American inventor Elisha Gray and his musical telegraphy in the 1870s. Even though I select here one key innovator, one cannot assume that it was only he who shaped the medium. Instead, in view of that what the last chapter has argued, usually several inventors and sociocultural relationships partake in the shaping of a technology. Characteristic of the cultivation phase of a new medium is that its main groups of inventors simultaneously embody the medium's main groups of users. Since Gray's sound technology still lacked in the full transmission of the human voice, I associate with the cultivation phase of telephone music the transformation from musical telegraphy into fully functional telephone music. This transformation occurred primarily in technologically advanced France under the auspice of telephone pioneer Clément Ader and his so-called auditions téléphoniques in Paris in the early 1880s.

Second, the early cultivation phase of musical telegraphy now slowly starts to move or differentiate, as another phase of media diffusion, into full telephone music. Unlike Gray's musical telegraphy, Ader's auditions téléphoniques already cover an extended group of users, including scores of mesmerised listeners at international trade fairs. It becomes clear that in this phase of telephone music, the users and producers of the medium did not represent the same social groups anymore. They became increasingly differentiated from early technology-centred cultures; that is, from the producer groups to early adopters of the medium. Different groups of people with different roles were involved in this phase of telephone music. Whereas the specialised or producer group's role was primarily technological, directly providing the public with a functioning sound transmission medium, by contrast the user's role in this phase was largely cultural in using the technology—to listen to transmitted music. This larger cultural adoption of telephone music marked the beginning of the medium's next phase of diffusion.

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[143] Author's translation from Kubicek/Schmid's full German title: "Alltagsorientierte Informationssysteme als Medieninnovation. Konzeptionelle Überlegungen zur Erklärung der Schwierigkeiten, 'Neue Medien' und 'Multimedia' zu etablieren. Soziale und organisatorische Entwicklungsprozesse von elektronischen Informations- und Kommunikationssystemen." Quote: "Kultivierung," "Differenzierung und Formalisierung," "Infrastrukturelle Basierung."

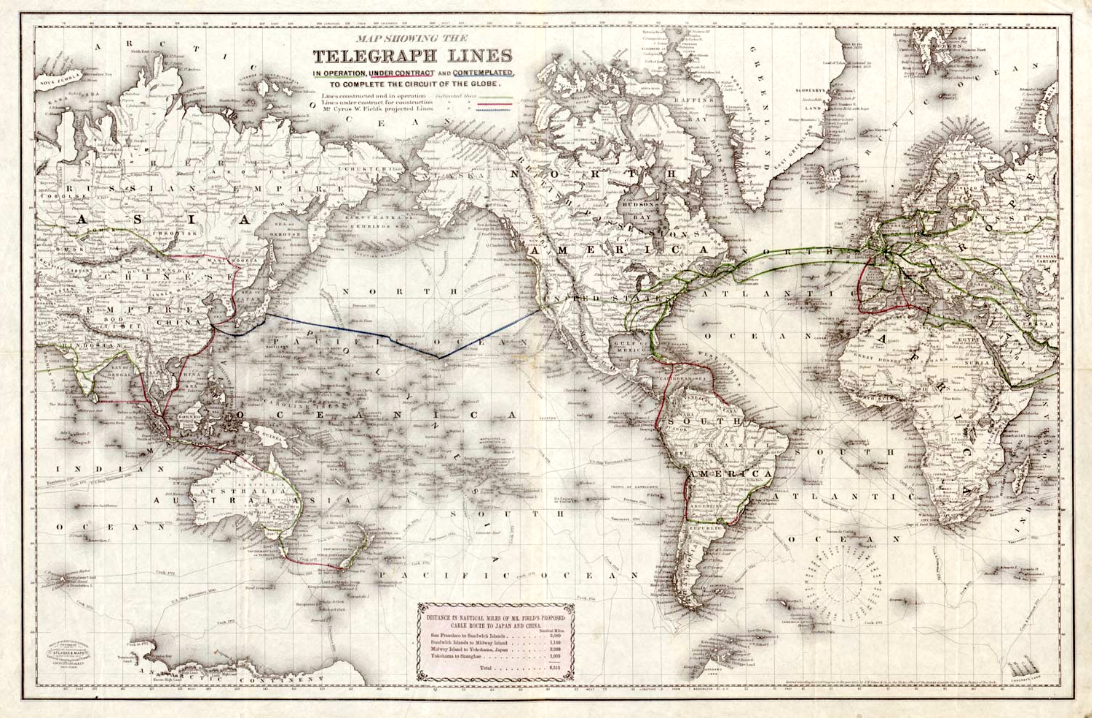
Finally, a characteristic of most media appears to be its cultural diffusion into society and everyday life. With telephone music, this characteristic turned, to a degree, into reality when the Compagnie du Théâtrophone, the Electrophone Limited and Telefon Hírmondó launched its services in main European cities throughout the 1890s. Even if the past decades of telephone music had already required—given the entrepreneurship—admission fees that people paid to listen to piped music and telephone concerts, the previous decades did not involve the specialised media companies of the 1890s. What the diffusion phase also characterises are further corresponding media appearances of telephone music such as advertisements; magazine, newspaper, and journal articles; manuals, and scholarly papers on the subject of telephone music. Note that this chapter focuses primarily on the French developments of telephone music, since Paris served as a role model for all subsequent developments of the medium in Europe. France is where the origins of European telephone music lie.

On a theoretical note, it would be wrong to assume that media developments always occur precisely in the outlined phases of cultivation, differentiation and diffusion. Kubicek and Schmid (1996) consider that media developments can hardly be planned, programmed or steered; they often appear unplanned and unexpectedly at different times. Critics might object that in Kubicek and Schmid's model it represents less an analytical framework of historical media diffusion than, for example, Kurt Blaukopf and Alfred Smudits' earlier-discussed theory of mediamorphoses. Though the theory of mediamorphoses in music does have a strong historical focus on electronic media developments, one should remember that the theory faces the issue of addressing extremely large historical phases of transformations in music and technology—up to several centuries. Such a broad historical framework would not be appropriate for the comparatively short period of telephony, as taken into account here between 1870 and 1900. In view of these three decades, Kubicek and Schmid's model of media diffusion in three phases provides a solid framework of analysis. Kubicek's and Schmid's framework is well defined, but more importantly, it represents an open, flexible, or dynamic enough framework to historically explore some key strands in the formation of telephone music. How skilled technology inventors, musical performers, gentle telephone operators, savvy entrepreneurs, and flabbergasted audiences shaped an entirely new musicsphere, is shown in the following pages.

4.1. Cultivation of Musical Telegraphy (1870s)

4.1.1. A New Musical Language

By the mid-1870s—as communications theorist Michael Gorman (1998) writes—"the telegraph had transformed the world." In his chapter "Creating a New World," Gorman explains that telegraphic "messages could now be sent over great distances [see Figure 13 below], much faster than any human messenger could have carried them and almost regardless of weather conditions" (120). Reminiscent of the Internet today, telegraph networks back then were also significant for military purposes. For instance, during the American Civil War (1861-1865), President Abraham Lincoln "spent much of his time at the telegraph office, communicating with his generals and assessing reports from the field" (127). Although telegraph inventors had already experimented with the transmission of phonetic or acoustic messages by the mid-1870s, Gorman's "creation of a new world" mostly involved the communication of graphical messages. Regardless of what telegraph inventors called their new products—speaking telegraphy, acoustic telegraphy, harmonic telegraphy, or musical telegraphy—all shared the same idea of extending the concept of telegraphy from graphical messages, to transmitting audible messages such as the singing human voice. But this extension from telegraphy to telephony involved some difficulties.


MAP SHOWING THE
TELEGRAPH LINES
IN OPERATION, UNDER CONTRACT AND CONTEMPLATED,
TO COMPLETE THE CIRCUIT OF THE GLOBE.
Lines constructed and in operation indicated thus
Lines under contract for construction
Mr. Cyrus W. Field's projected Lines
ARCTIC OCEAN
RUSSIAN EMPIRE
ASIA
CHINESE EMPIRE
NORTH AMERICA
NORTH PACIFIC OCEAN
OCEANICA
INDIAN OCEAN
AUSTRALASIA
SOUTH PACIFIC OCEAN
SOUTH AMERICA
NORTH ATLANTIC OCEAN
SOUTH ATLANTIC OCEAN
AFRICA
ATLANTIC OCEAN
ANTARCTIC CONTINENT
DISTANCE IN NAUTICAL MILES OF MR. PHILIP'S PROPOSED CABLE ROUTE TO JAPAN AND CHINA.

[Fig. 13] Map of international and submarine telegraph lines, 1870.[144]

Instead of one single inventor, several different inventors formulated the concept of telephony in Europe and America including, among others, Innocenzo Manzetti, Charles Bourseul, Antonio Meucci, Philipp Reis, Thomas Edison, Elisha Gray and the familiar telephone pioneer Alexander Graham Bell.[145] As the Italian Antonio Meucci worked on his so-called Telectrophone in Staten Island, New York, Belgian Charles Bourseul, a soldier and telegrapher, also worked hard in Paris on human voice transmissions.[146] Though Bourseul formulated his ideas on telephony in the essay "Transmission Électrique de la Parole" (1854), his and also Meucci's ideas of the sound medium fell into oblivion. Two years before physicist Hermann von Helmholtz published his influential theory *On the Sensations of Tone* (1863) (discussed later), German physicist and teacher of the deaf Philipp Reis put ideas into practice. On October 26, 1861, Reis demonstrated his telephone invention, shown in Figure 14 further below, to the Physikalischer Verein or Physical Society in Frankfurt. It is popularly believed that on that occasion in 1861, Reis fully transmitted either one of the spoken phrases: "The horse does not eat cucumber salad" or "The sun is of copper."[147] However, this belief is considered to be a myth since Reis' transmitter was supposedly incapable of transmitting full human speech—only a limited range of tones. Gorman (1998) describes how Reis' transmitter created these tones:

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[144] Bill Burns (2009) "History of the Atlantic Cable & Undersea Communications from the first submarine cable of 1850 to the worldwide fiber optic network," available at http://atlantic-cable.com/Maps/index.htm (April 2012).

[145] On the mystery over the invention of the telephone, see, among others, David Robertson (2006) "The Great Telephone Mystery," in *IEEE Review*, vol. 52, iss. 2, pp. 44-8.

[146] More on Meucci, see Gerry Vassilatos' (1999) chapter "Hearing Through Wires: Antonio Meucci" (56-75) in *Lost Science*, Adventures Unlimited Press, Kempton, Illinois.

> The [Reis] transmitter consisted of a lever with a point, which rested on a membrane; when one sung a note, the membrane would cause the lever [to] bounce, alternately making and breaking contact with a piece of platinum in the middle of the membrane. This intermittent, on-off current would alternately magnetize and de-magnetize a receiving electromagnet, which would reproduce whatever tone had been sung into the membrane (127).

In addition to the technological and musical instrumentality of Reis' invention, Gormann also mentions its notoriety: "the Reis apparatus was widely known at the time of 1880" (127). The German magazine *Die Gartenlaube* reported in 1863 on Reis' invention in an article called "Der Musiktelegraph" or "The Music Telegraph." Besides detailing how Reis' invention functions, the article also introduced readers to the new linguistic expression and activity "to telephone." *Die Gartenlaube* explains, "'to telephone' is derived from Greek and means 'to hear in the distance' like 'to telescope' means 'to see in the distance'" (808) just as 'to telegraph' means 'to write in the distance.'[148] Reis' telephone transmitter and receiver devices are shown in Figure 14, below.

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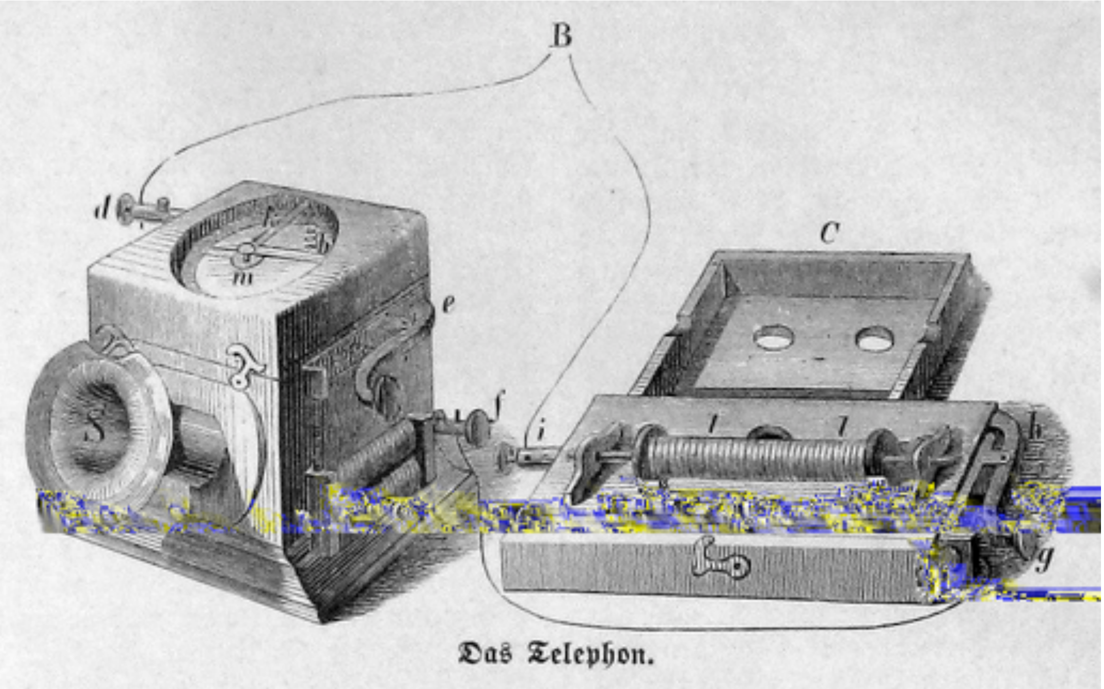
[147] Author's translation from German: "Das Pferd frisst keinen Gurkensalat" and "Die Sonne ist von Kupfter," in physicist Carsten Heinisch (2010: 175-6) *101 Rück-Blicke: Erinnerungen an Tage*, Books on Demand, Norderstedt, Germany.

[148] Author's translation from German: "'Telephoniren' ein nach dem Griechischen gebildetes Wort, was 'in die Ferne tönen' bedeutet, wie 'teleskopiren' in die Ferne sehen" (original spelling).



[Fig. 14] Philipp Reis' telephone, 1863: transmitter (left), receiver (right). (The lettered parts in this drawing involve technical specifications irrelevant to the discussion here).[149]

Neither the idea of musical telegraphy nor that of telephone music were completely unfamiliar at the time of Reis' experiments in the 1860s. In 1835, Sholto Percy of the British journal *Iron* reported in "The Telephony, or Musical Telegraph" that French musician Jean-François Sudré had invented a new "Musical Language" that he had already unveiled to the French Academy of Fine Arts in 1828. Predating Samuel Morse's telegraphic code by several years, Sudré's musical language (later known as Solresol) consisted of "seven musical signs: re, mi, fa, sol, la, si, do" in different combinations (the musical scale is usually structured thus: do re mi fa sol la si—then it repeats). *Iron* expected that through Sudré's musical language and its related "music instruments," a complete "system of telegraphic communication might be established." Reminiscent of early computer networks and communication protocols, Sudré's "'Musical Language' might prove eminently useful in establishing a correspondence between the different corps of an army" (269). Perhaps a later military telegraph, as portrayed below in Figure 15, "might have been the means of saving the French army from discomfiture" during the Peninsular War among France,

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[149] "Der Musiktelegraph," in *Die Gartenlaube*, ed. Adolf Kröner (1863: 809), Ernst Keil Verlag, Leipzig.

Spain, the United Kingdom and Portugal over the ownership of the Iberian Peninsula (1808-1814).

At the Battle of Bussaco in 1810, the “attack made by the French troops failed” because one army corps’s foot march was “arrested by a deep chasm” (269). Thus the corps was “unable to give immediate information of the circumstances to the other divisions from which it was separated by the abrupt winding of the mountains” (270). For this reason, *Iron* further assumed in 1835 that Sudré’s new musical language and a telegraphic network would “enable men to correspond instantaneously with each other at great distances, not only during the most profound darkness, but under circumstances in which even in open day, no communication by visible signals could possibly be carried on” (269-70). Even several decades later in the early 1870s, telegraphy and telephony did not yet involve a full transmission of acoustic signals, as required for distance music.[150]

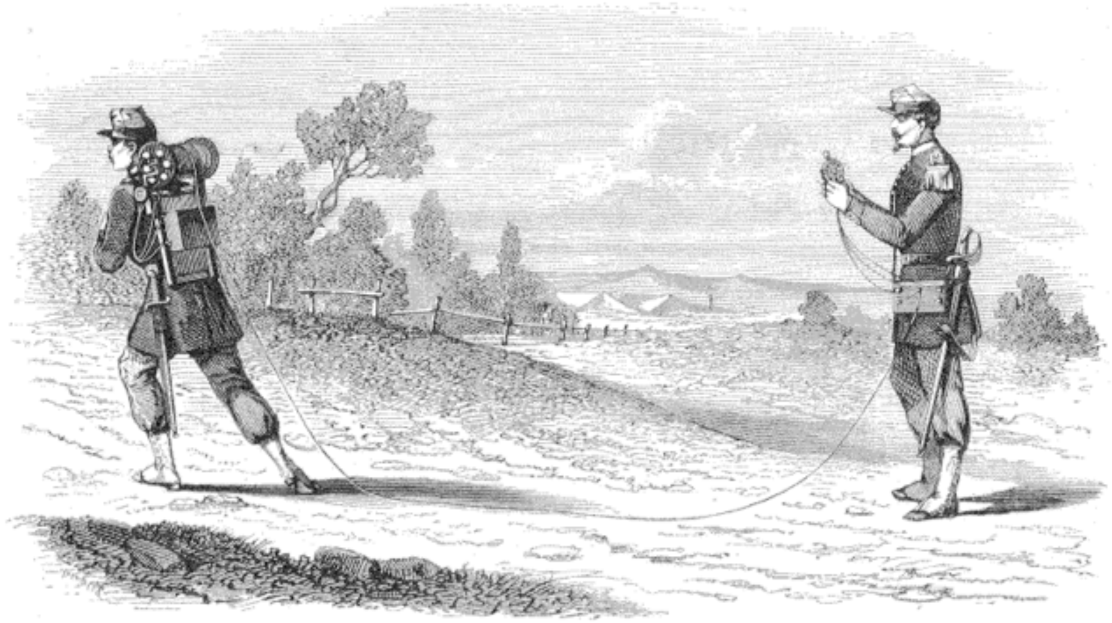

Fig. 1 — Mode d’emploi du système de télégraphie militaire de M. Trouvé.

[Fig. 15] Military telegraph of the mid-1870s.[151]

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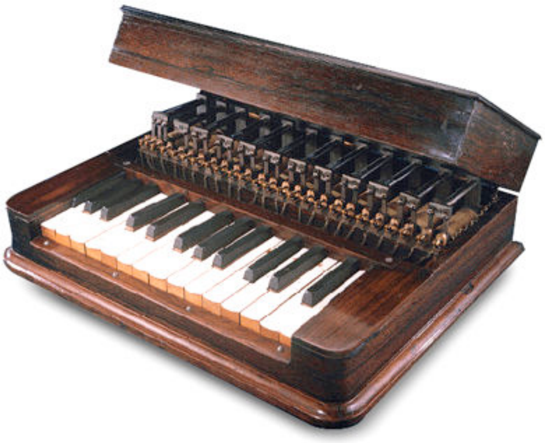
[150] More on telegraph history in Tom Standage (1998) *The Victorian Internet: The Remarkable Story of the Telegraph and the Nineteenth Century’s On-Line Pioneers*. Walker & Company, New York. Also, Faulstich’s (2004) chapter “Der Telegraph” (48-60), Beauchamp (2001), Daniels (2002).

[151] Alf Niaudet (1876: 392) “Télégraphe Militaire: Systèmes de M. Trouve,” in *La Nature*, vol. 4, iss. 131-56, pp. 392-4.

4.1.2. A Number of Familiar Melodies

Transmission of speech or live music was not possible until Alexander Graham Bell and his assistant Thomas Watson proved it on March 10, 1876: Bell famously spoke into his telephone: “Mr. Watson, come here. I want to see you.”[152] Until this momentous event, that many perceive as the birth of telephony, sound transmission emerged gradually in stages by telegraphy—sometimes confusingly referred to as telephony.

On July 27, 1875, the United States Patent Office granted electrical engineer Elisha Gray a patent on the so-called “Electric Telegraph for Transmitting Musical Tones.” “My invention,” Gray (1875) writes in his patent specifications, “relates to what I term an ‘electro-harmonic telegraph’ … for the transmission of intelligible signals to a distance by electricity” (3). With his musical telegraph invention, Gray had improved the “combination” of already existing telegraphic circuitry so that, as he put it, “I am able to reproduce melodies or tunes” (1) using telegraph keys; later versions looked like piano keys (see Figure 16 and Figure 17 below). Gray further envisioned in his patent specifications that his musical telegraph would be even suitable for “telegraphing on long land and submarine lines” (2). As Gorman mentioned earlier, these networks were already sophisticated enough to connect the world by the mid-1870s.



[Fig. 16] Elisha Gray’s Musical Telegraph, 1876.[153]

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[152] Bell (1876) cited in Gorman (1998: 160).

[153] Simon Crab (2005) “Elisha Gray and The Musical Telegraph,” in *120 Years of Electronic Music: Electronic Musical Instruments 1870-1990*, available at http://120years.net/machines/telegraph (April 2012).

Several of Gray's contributions to musical telegraphy preceded his aforementioned patent application in 1875. For instance, six months earlier on Tuesday, December 29, 1874, Gray demonstrated his musical telegraphy at the Presbyterian Church in Highland Park, Illinois. According to a reproduction of the original advertisement of this event in Sterne (2003: 252), the *Chicago Evening Journal* announced a "Grand Concert" along with the "first public exhibition" of Gray's "electric telephone." That evening, an audience would witness "vocal and instrumental" music from several live performances. The audience would listen to "a number of familiar melodies," "transmitted from a distance through telegraphic wire" and "received upon violin and other instruments within the room."[154] Curator Harold Warp (1978), who exhibits Gray's musical telegraph at the Pioneer Village in Minden, Nebraska, describes Gray's event at the Presbyterian Church:

> [William] Goodridge, acting as Gray's assistant, set up a musical transmitter in the pastor's study. The inventor, stationed in the church, directed the current through a band switch to four violins and a piano, strategically placed around the church hall and wired for sound to bring in Goodridge's performance (243-4).

Before his "Grand Concert" at the Presbyterian Church, Gray had already effectively experimented, "tinkered" with (Weidenaar 1995: 2) and "systematically tested" (Gorman 1998: 130) several transmitter and receiver devices. Only because of these preceding technological experiments was Gray at all able to give his Grand Concert and "several impressive demonstrations in New York and Washington, D.C. in May and June, 1874" (ib.). In a sense, "Gray took the instrument on tour with him" (Crab 2005) throughout the United States to "stage demonstrations in which the musical telegraph transmitted musical signals over ordinary telegraph wires to a receiver stationed as far away as 200 miles" (Holmes 2008: 6). Again, the music Gray's telegraph produced consisted 'simply' of a few electronically generated sounds that we would now call synthesiser sounds; Gray neither transmitted the human singing voice nor the sounds of acoustic musical instruments during his public demonstrations. In his book about engineer Thaddeus Cahill's *Magic Music from the Telharmonium* (1995), author Reynold Weidenaar notes that the person who "transmitted the first experimental long-distance" live musical performance was actually Alexander Graham Bell. In 1876, Bell attached a "triple mouthpiece" to a "speech transmitter so that the vocalists could sing into it together" (2) over a distance of 12 kilometres on telegraph wires between Paris and Brantford, Ontario, Canada.

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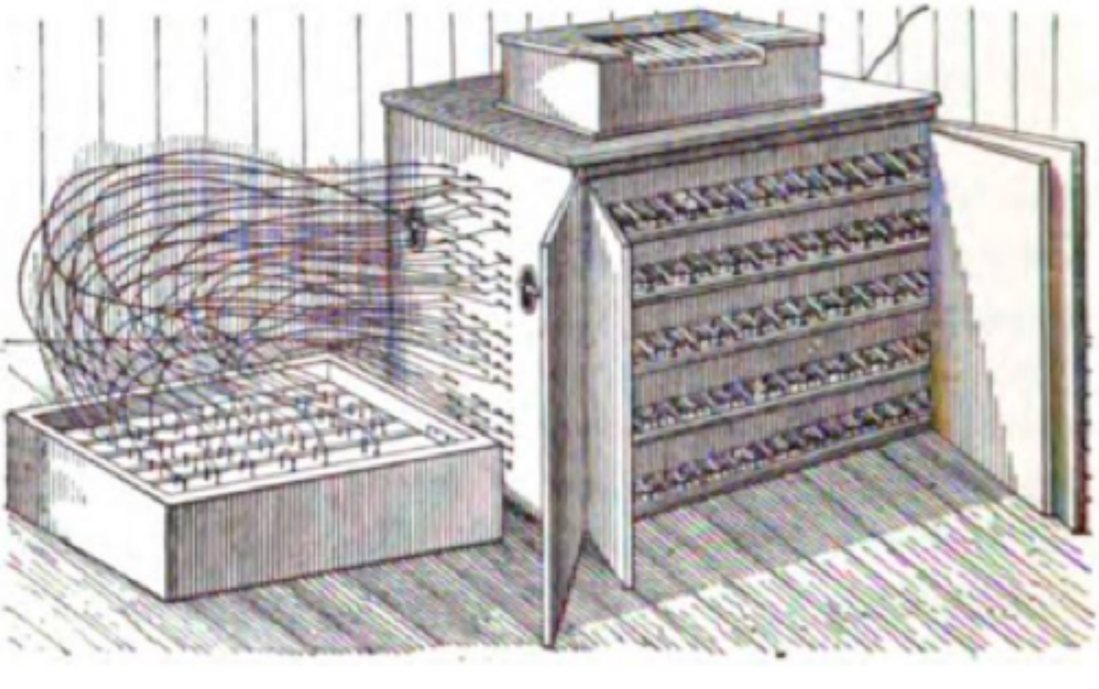
[154] See Harold Warp (1978: 244) *A History of Man's Progress, from 1830 to the Present*, Harold Warp Pioneer Village, Minden, Nebraska. Also, Holmes' (2008: 1-116) chapter "Early History—Predecessors and Pioneers (1874 to 1960)" of electronic music.

While Thomas Edison's mechanical phonograph began to usher in our modern era of recorded music, Gray still continued demonstrating to the public his musical telegraph. On April 2, 1877, he electronically bridged as much as 160 kilometres of distance across telegraph wires. In a series of six demonstrations of musical telegraphy, Gray hosted the earliest one in the cosmopolitan Steinway Hall—a large music cultural hub containing an auditorium with sufficient seating capacity for 2,000 listeners—on East 14th Street in New York City.[155] According to Weidenaar (1995), Gray's event was "widely publicised." A reprint of the original advertisement, offered by Sterne (2003), heroically announced "Telephone Concerts—Transmission of Music by Telegraph—Triumph of American Science—Musical Melodies will be performed in Philadelphia and distinctly heard by the audience in New York" (253).



[Fig. 17] Gray's musical telegraph used for Philadelphia—New York concert, 1877.[156]

Confusingly enough, as Weidenaar (1995: 2) finds, "no telephone was in fact employed" for Gray's telephone concert. Whereas some musicians appeared in person at Steinway Hall, the famous pianist of the day Frederick Boscovitz performed the following six melodies: “Home Sweet Home,” “Com’e Gentil,” “Then You’ll Remember Me,” “The Last Rose of Summer,” and “The Carnival of Venice” at the Western Union Telegraph Company in Philadelphia. Instead of using a piano and a telephone to play these melodies, Boscovitz used Gray’s Musical Telegraph. It was only “a 16-key telegraphic reed transmitter,” and Weidenaar further details, the “audience in New York listened in rapt incredulity to the buzzer-tone music, nearly all of which was played with one hand.” Whereas “the receiver was built of 16 resonant hollow wooden tubes … the receiving apparatus was mounted on an otherwise unused grand piano on the stage of Steinway Hall,” shown in Figure 18 below. Although “the tones were said to be distinct … the higher notes were very faint.” A music critic commented on this telegraph concert that it would be “difficult to see how the transmission of music over the new instrument can be of permanent practical value.”[157]

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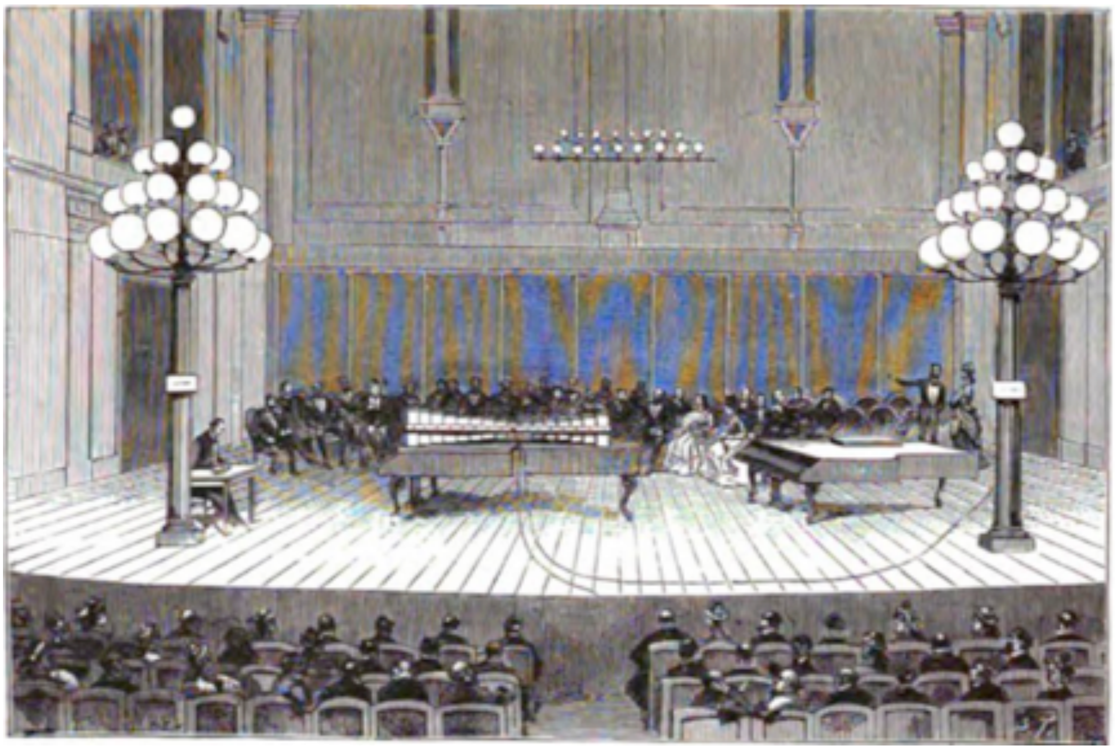
[155] Further information on the "Steinway History: Leadership through craftsmanship and innovation" is available at http://www.steinway.com/about/history/ (April 2012).

[156] Édouard Hospitalier (1881: 230) *La Physique Moderne: Les Principales Applications de L'Électricité*, G. Masson, Paris.



[Fig. 18] Stage and auditorium of Gray’s musical telegraph concert in New York, 1877.[158]

Gray’s telegraph concerts also had some valuable consequences. When comparing his 1874 with his 1877 concert advertisements, it becomes clear that audience admission fees had already doubled within three years. In 1880, an average annual United States per capita income was $309, or $25.75 per month and $6.43 per week.[159] Though the admission fee of 75 cents (reserved seat) to Gray's earlier concerts seems inexpensive, a ticket of $1.50 (reserved seat) to his later concerts in the Steinway Hall cost more than a day of average United States income at that time. Despite the obvious fact that not everyone could afford Gray's telegraph concerts, the increased admission fee and the upscale public locations where Gray staged his concerts suggest an increased public interest in sound transmission. To generate even more interest in it, Gray's concerts were cleverly marketed as cross-promotional events of traditional live musical performance along with technological innovation—a "Triumph of American Science." In a sense, Gray moved his transmission medium from a church into America's flagship concert halls. Besides Steinway Hall in New York City, Gray also staged his concerts in cultural establishments such as the Brooklyn Academy of Music and Abraham Lincoln Hall in Washington, D.C.

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[157] Weidenaar (1995: 2-3).

[158] Édouard Hospitalier (1881: 233).

Although Gray used musical telegraphy for commercial ventures, the technology to realise telephone music remained largely experimental in the 1870s. For example, though Edison's carbon speech transmitter, among other devices, enhanced developments in telephone music, other problems such as the transmission network itself entered the scene. For instance, in August 1877, a telephone concert between New York City and Saratoga Springs in New York State suffered problems in the audio transmission, allowing people in Providence and Boston to accidentally listen in on the concert. Weidenaar (1995) sees the cause for this transmission accident in that the "music had transferred by capacitance, induction, and conduction leakage." Only advanced investigations into the telegraphic circuitry solved these initial problems. Telephone concerts became realistic only about two decades after Reis' early telephone experiments in the 1860s. Ever since, as Carolyn Marvin (1988) portrays in her chapter "Performances by Wire" (209-16), telephone concerts progressively occurred throughout the United States from the 1880s onwards. By contrast, telephone music in Europe originated in France; there it followed a different path of technocultural development.

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[159] Simon Kuznets (1952: 115) "National Income Estimates for the United States prior to 1870," in *The Journal of Economic History*, vol. 12, iss. 2, pp. 115-30.

4.2. Differentiation of Telephone Music (1880s)

4.2.1. Auditions Téléphoniques

Unlike in the United States, in France the notion of telephone music originally implied the transmission of theatrical plays—its human voices, musical performances, acoustic effects, and silence on stage. Early telephone technology spatially extended and widened theatrical performances, making them available to people outside the theatre. People called it "auditions téléphoniques" (Mourlon 1885: 103-29). Auditions téléphoniques were theatrical performances extended by telephone. Staged for the first time publicly in Europe, auditions téléphoniques were "the most popular success" (Turgan 1882: 68) of the Exposition Internationale d'Électricité in Paris from August 11 to November 20, 1881.[160] The entire exposition "amply fulfilled the multiple objectives of its main patron, the [French] Minister of Posts and Telegraphs, Adolphe Cochery" (Fox 1993: 203). Even over a decade later in 1894, the Canadian journal *Album Industriel* reports the success of auditions téléphoniques in Paris and how the new media trend quickly spread across Europe: Most following international expositions such as in Munich in 1882, Vienna in 1883, Paris in 1889, and in Frankfurt 1891—had "had their musical telephone hearings [performances]" (122).

Large international expositions were common in the late 19th century.[161] The 1881 Paris Exposition Internationale d'Électricité, with 750,000 to 900,000 visitors, was the world's first exposition exclusively dedicated to the rising demand of electricity and electrical devices.[162] In his book *Exhibiting Electricity* (1997), engineering historian Kenneth George Beauchamp explains that electricity became increasingly important for all industrialised nations in the second half of the 19th century; that is why "special exhibitions, or large separate sections of international exhibitions," were "devoted entirely to electrical apparatus" (159). A floor plan of the

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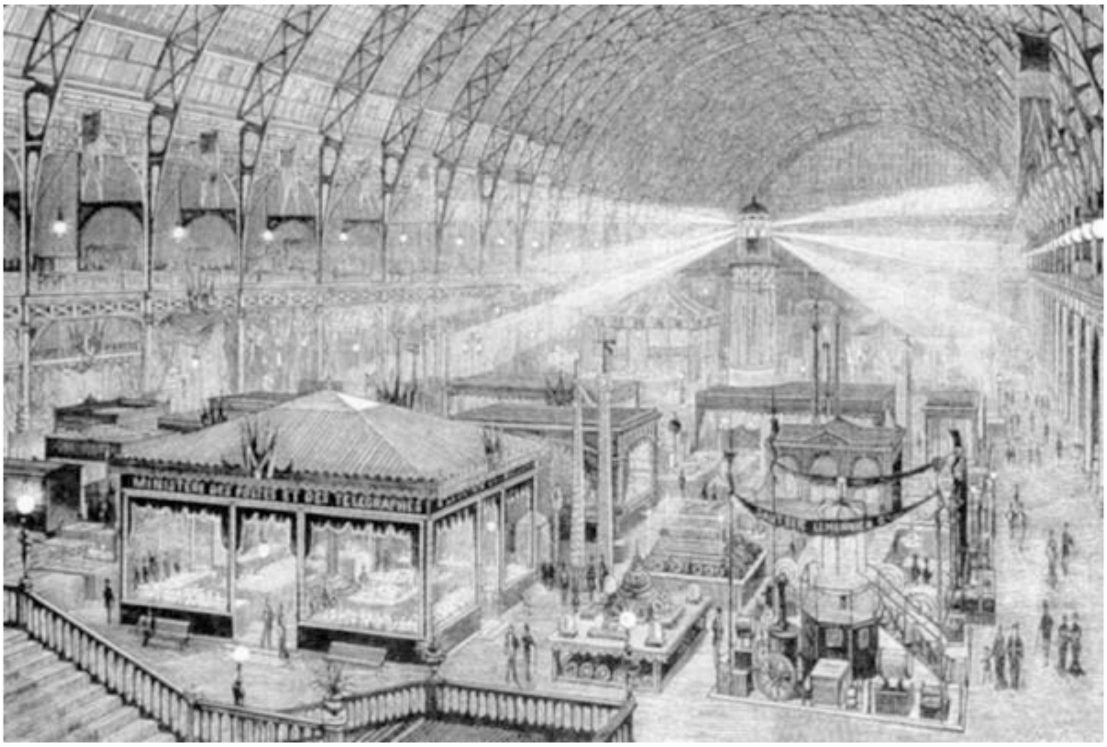
[160] Author's translation from French: "fut le succès le plus populaire de L'Exposition d'électricité." For traditional musical interludes at the earlier Paris Exposition Universelle, 1878, see French Ministère de l'Agriculture et du Commerce (1881) "Notice Sur Les Auditions Musicales" (593-622), in *Rapport Administratif sur l'Exposition Universelle de 1878 à Paris*, Imprimerie Nationale, Paris.

[161] The Bureau International des Expositions (BIE) provides a comprehensive list of world expositions. Note that "world exposition" means large events that last between three to six months. The Paris Exposition Internationale d'Électricité, 1881, was not a world exposition. See Beauchamp (1997), and on electricity and communication at Paris trade fairs between 1867-1900, see also Patrice A. Carré (1989) "Expositions et modernité: Electricité et Communication dans les Expositions Parisiennes de 1867 à 1900," in *Romantisme,* vol. 19, iss. 65, pp. 37-48.

[162] Borvon (2009) states "750 000 personnes." Fox (1993: 203) "more than 800,000 visitors." A. Carré (1989) "près de 900 000 visiteurs."

1881 Paris Exposition Internationale d'Électricité shows several pavilions and booths displaying electrical apparatuses made in England, Germany, the United States, Belgium, Austria, the Netherlands, and Italy. The exhibition's main objective was to demonstrate publically the latest technological products in the production, storage, and use of electrical energy, including generators, batteries, and motors. In telecommunications, Alexander Graham Bell demonstrated his electric telephone, which enabled people to hear and speak at a distance. In public transportation, Werner von Siemens presented the first electric tramway (people still used horse-drawn carriages back then). And Thomas Edison displayed, among other things, a light bulb and a massive electric generator for industrial uses.[163] Indeed, the technological achievement of electric light for various areas of human life was a major theme of the Exposition Internationale d'Électricité.



[Fig. 19] Paris Exposition Internationale d'Électricité, 1881.[164]

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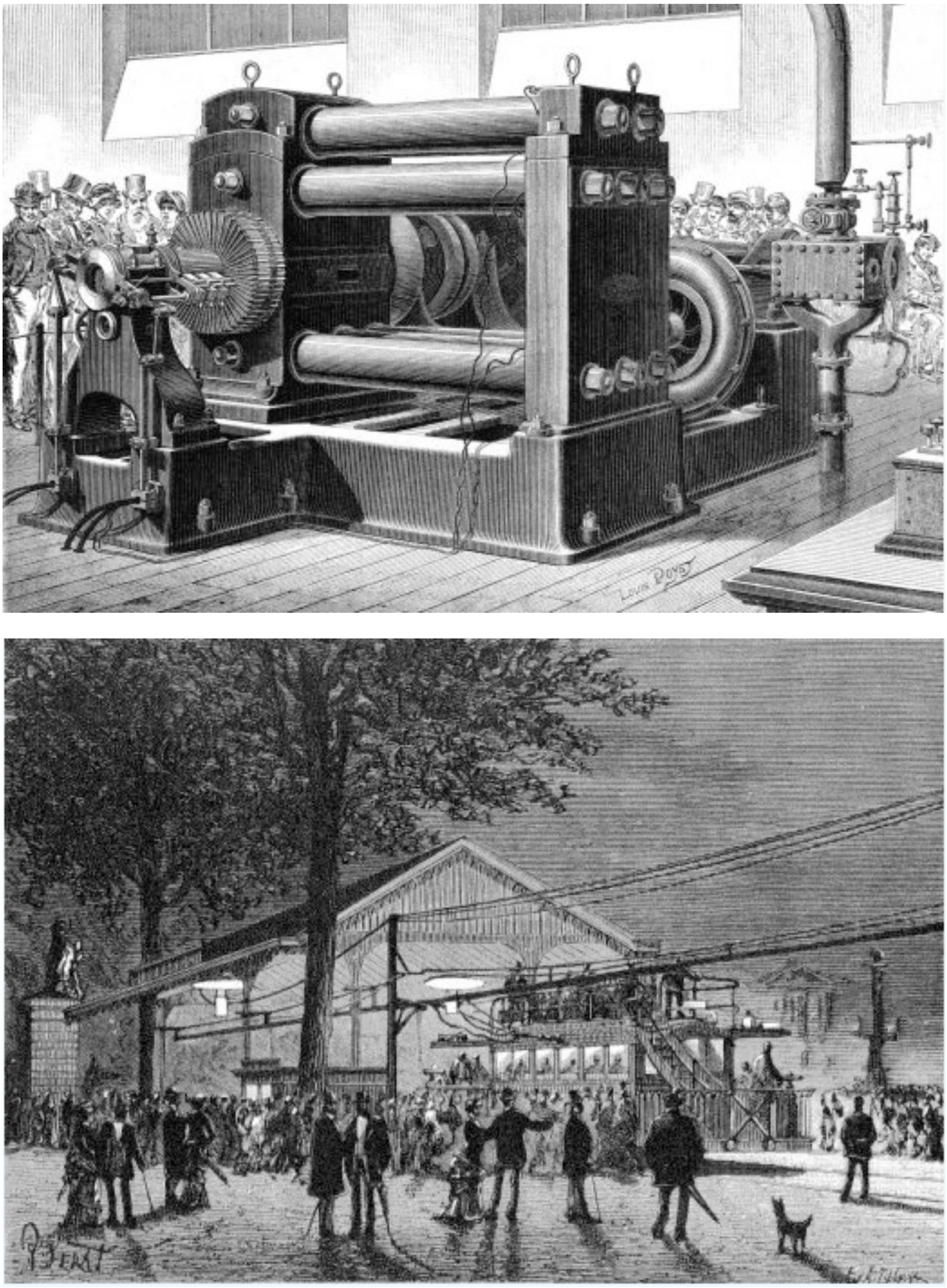
[163] See Gérard Borvon (2009) "Histoire de l'électricité. L'exposition Internationale d'électricité de 1881, à Paris," in *Histoire de l'électricité: De l'ambre à l'électron*, available at http://seaus.free.fr/spip.php?article500 (April 2012).

[164] Daniel Dubuisson (2010) "Exposition Internationale d'Électricité 1881," available at http://hippostory.lyceehfontaine.fr/index.php?page=Exposition-Internationale-Electricite-1881 (April 2012).


Louis Poyet

[Fig. 20] Edison's electric generator and Siemens' electric tramway, 1881.[165]

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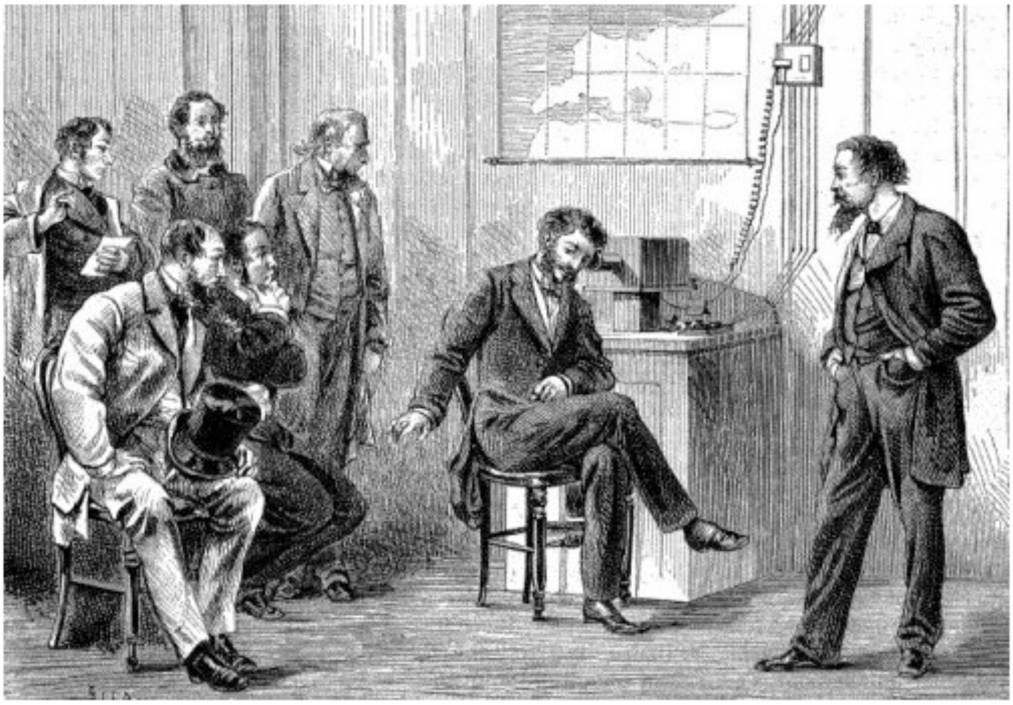
[165] Gérard Borvon (2009).

In the light of the technological progress in the 19th century, consider also how human living conditions were different back then. For instance during winter seasons, most people in higher latitudes had light "only seven to eight hours a day, at most, to see clearly," as French physician and scientist Julian Turgan in *Les Grandes Usines: Études Industrielles en France et a l'Étranger* (1882) hints at some of the problems of everyday life at that time. He states that the "real struggle is that of man against the environment" (68). Everyday life was beset with frustrating obstacles: "Coldness, humidity, fatigue, lack of light, and distance are the real obstacles, the real tyrants who attend man in his freedom to exist, to move, to work, to acquire his salary," and they "take away the possibility of communicating with others" (66). Turgan's point is that the Paris Exposition Internationale d'Électricité provided solutions to such obstacles, especially in distance communication. Bell had already demonstrated his telephone several years earlier at the Paris Exposition Universelle in 1878 and the Philadelphia Centennial Exposition in 1876. *Scientific American* (1881: 422) called his telephone demonstrations the transmission of the "first feeble voices." Yet, truly ground breaking at the exhibition in 1881 were auditions téléphoniques, or performances over the telephone.



[Fig. 21] Listening to Bell's telephone in 1876. It was an early long-distance telephone demonstration with Bell speaking in Salem, Massachusetts, and listeners about 30 kilometres away in Boston.[166]

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[166] Gérard Borvon (2009).

Crowds gathered every night in front of the Palace of Industry on Champs-Élysées street. That is where the 1881 Exposition Internationale d'Électricité took place. For the entire three months and nine days of exhibition period, visitors had the opportunity to listen to auditions téléphoniques every night for three hours between 8-11 p.m. During that time, visitors rushed around a large electric lighthouse in the middle of the hall, illuminating the whole place with its rotating lights of different colours—anticipating 20th century sea communication. While some visitors admired the lighthouse, most went to the much-vaunted telephone pavilion Ministère des Postes et Télégraphes (see left exhibition booth in Figure 19 further above). At this pavilion visitors had to queue up in line and wait sometimes for several hours to enter. Once the pavilion staff granted them access, visitors could go, in groups of 20 people, into one of the two specially designed listening rooms.[167]

Inside the listening rooms, electric light bulbs in a large round chandelier mounted on the ceiling lit up the space. Figure 22 below portrays the listening rooms with thick, longitudinally striped carpets on the floor and walls. These carpets gave the listening room a touch of ornate theatre atmosphere, and functioned as a protection from unwanted outside noises. In some sense, these listening rooms provided the unique atmosphere of an oversized public telephone booth (not yet invented), instead of an authentic theatre atmosphere. In the middle of each listening room stood a table cordoned off by a little tightrope fence, looped along four posts. A man sat at the table with a telephone in front of him. Frequently, he must have called the electrical engineers at the Opéra de Paris waiting to pass on instructions to a new group of visitors when it was their turn for listening.

Several telephone devices were mounted along the walls of the listening rooms. Unlike today, telephones then, at least those in the listening rooms, had two receivers—one for each ear. But each visitor—due to technical reasons and the strong public appearance at the exhibition—had only permission to listen to five minutes of distant stage performance at the Opéra de Paris (several kilometres away). While standing in front of a telephone device with both receivers close to the ears, their heads faced the wall or other people in the room as opposed to the theatre stage. Still, what the visitors heard in this very moment of harking into the medium were, as Turgan (1882: 68) recalls, the "powerful and distinct" voices and sounds of theatre actors and musicians performing several kilometres away.[168] As if by magic, now a distant audience could hear people perform without seeing them.

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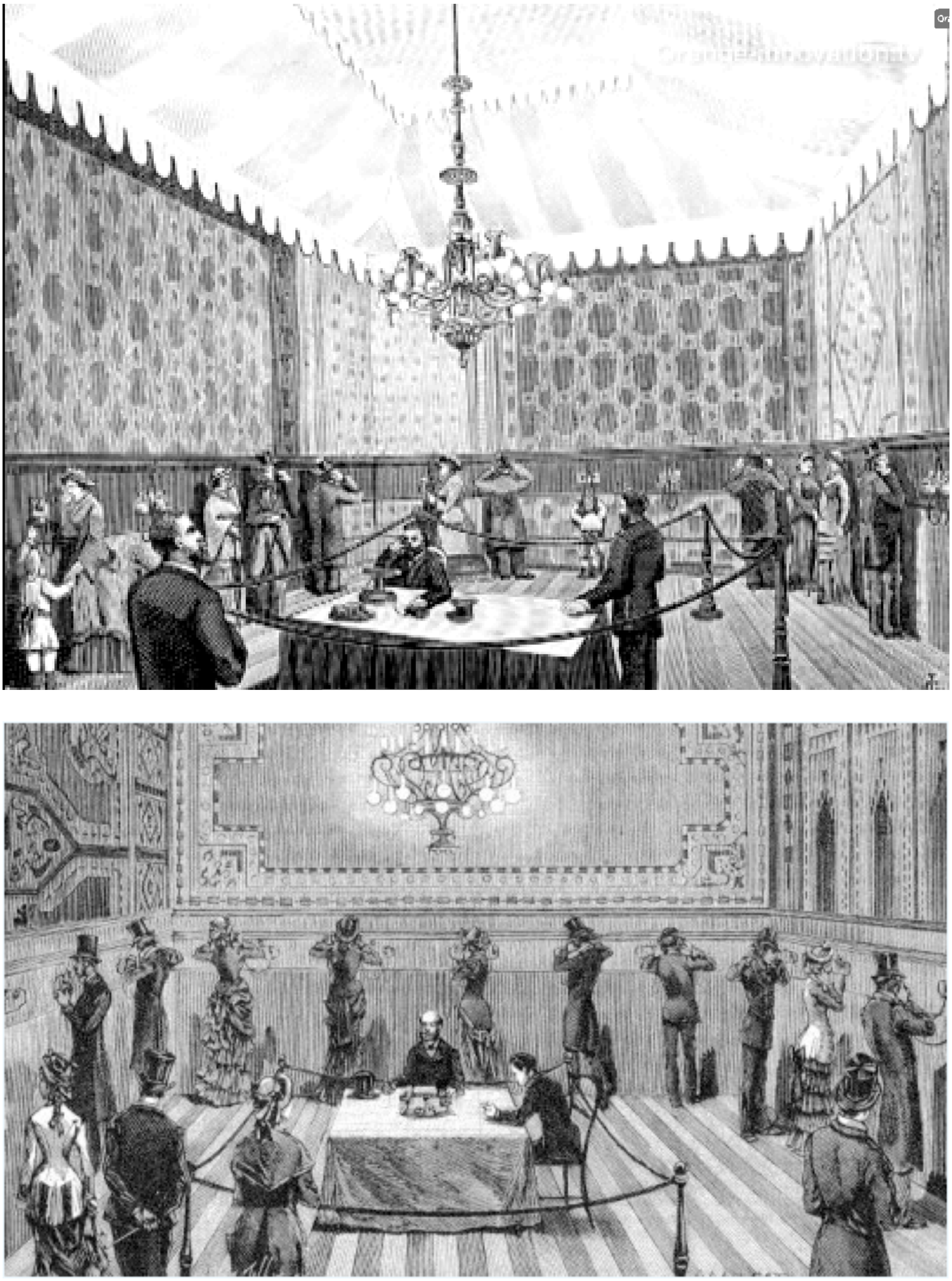
[167] Turgan (1882: 112) calls listening rooms "salle des auditions de l'Opéra," and Borvon (2009) "Salle de réception."



[Fig. 22] Inside the listening rooms at Paris Exposition Internationale d'Électricité, 1881.[169]

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[168] Author's translation from French: "puissants et distincts."

Behind the audiences' magical listening experience was the work of French telephone pioneer Clément Ader; he was responsible for this magical extension of theatrical space and time.[170] Ader successfully combined the well-known cultural concept of theatrical plays with the technological concept of telephony into the new concept of auditions téléphoniques. He did so strategically as a perfectly organised and well-marketed technocultural mass event. From abroad, *Scientific American* (1881) commented on Ader's accomplishment at the Paris Exposition Internationale d'Électricité, "certainly nothing has ever been done before so effectually to popularize science" (422-3).

Ader was also a director and "distinguished engineer of the Société Générale des Téléphones" (Turgan 1882: 70). It was the earliest major telephone company in France, joining forces with another company in 1880 to install telephone networks throughout the nation—until other companies took over in 1889.[171] What Ader did as an engineer was to develop a highly sensitive telephone transmitter, which, after an extensive experimentation-and-testing phase, he finally mounted at the Opéra de Paris for public demonstration. His telephone "transmitters" as Turgan explains, "are the same as used in the telephone network of Paris; only they are slightly modified for this particular use [at the Opéra] because of the multitude and variety of sounds they are meant to communicate" (65-76).[172] What Turgan calls a "slightly modified" transmitter, today we would call a carbon microphone.

"When speaking to the wooden plate" of Ader's microphone, Turgan (1882) continues, the generated acoustic sound waves caused the wooden plate to vibrate. These "vibrations are transmitted to the carbon" underneath the wooden plate—a process driven by electrical currents to "modify each vibration," similar to modern carbon microphones.[173] It was not the actual sound—brought by underground cables

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[169] Screenshot from Patrice A Carré's (2007) interview "Le Théatrophone," in "Pédagogie," *Orange Innovation TV*, France, available at http://www.orange-innovation.tv/webtv/le-theatrophone/video-102-fr (April 2012); Borvon (2009).

[170] A technically informed account (in French) on Ader's contributions to telephone music is provided by engineer Alain Vassel (2010) in "Une grande réussite d'Ader, le telephone," available at http://alain.vassel.pagesperso-orange.fr/biographie-ader2.html (April 2012).

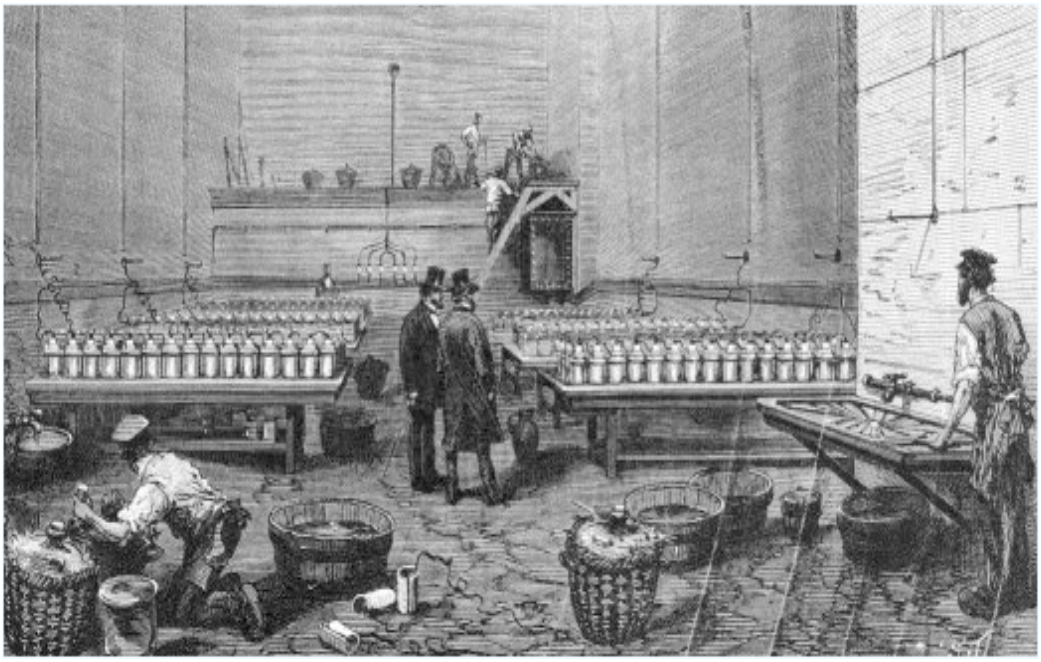
[171] Author's translation from French: "M. Ader, ingénieur très-distingué de la Société générale des téléphones." Australian telephone collector Bob Estreich emphasises Ader's sensitive telephone transmitters in "Clement Ader," available at http://www.bobsoldphones.net/Pages/essays.htm. The establishment of the French Société Générale des Téléphones describes Frédéric Nibart (2004) in "La Création de la S.G.T." available at http://fredouille.pagesperso-orange.fr/creation.htm (April 2012).

[172] Author's translation from French.

[173] Technical details on carbon transmitters offers Édouard Hospitalier (1883) "Investigations of the Electrical Resistance of Carbon contacts," in *The Electrician*, vol. 2., pp. 126-7.

through the Paris sewage system—that arrived at the listening rooms. It was the electrical impulses. While the telephone transmitters in the Opéra de Paris transformed the sounds produced by the actors and musicians into electrical currents, the visitors' telephone earpieces in the listening rooms at the exposition retransformed the electric currents into sound. In other words, through sound transduction Ader made the human voices and music from the Opéra audible to distant listeners.[174]

Ader could not simply plug and play his telephone transmitters as we can now. Electrical generators were still rare in those days. Thus underneath the theatre stage of the Opéra de Paris there was a large basement with hundreds of medium-sized electrical batteries that looked like milk bottles clustered on tables. These were connected to transmission cables systematically routing through conduits upstairs on stage to the telephone transmitters (see Figure 23 below). What the excited telephone audience in the listening rooms at the grand exposition probably did not know about was the kneeling human work force in the battery basement at Opéra de Paris who powered the audience's listening experience. This human workforce had to "renew" the transmitter batteries "every 15 minutes" (Turgan 1882: 74) to ensure an uninterrupted listening experience.[175]



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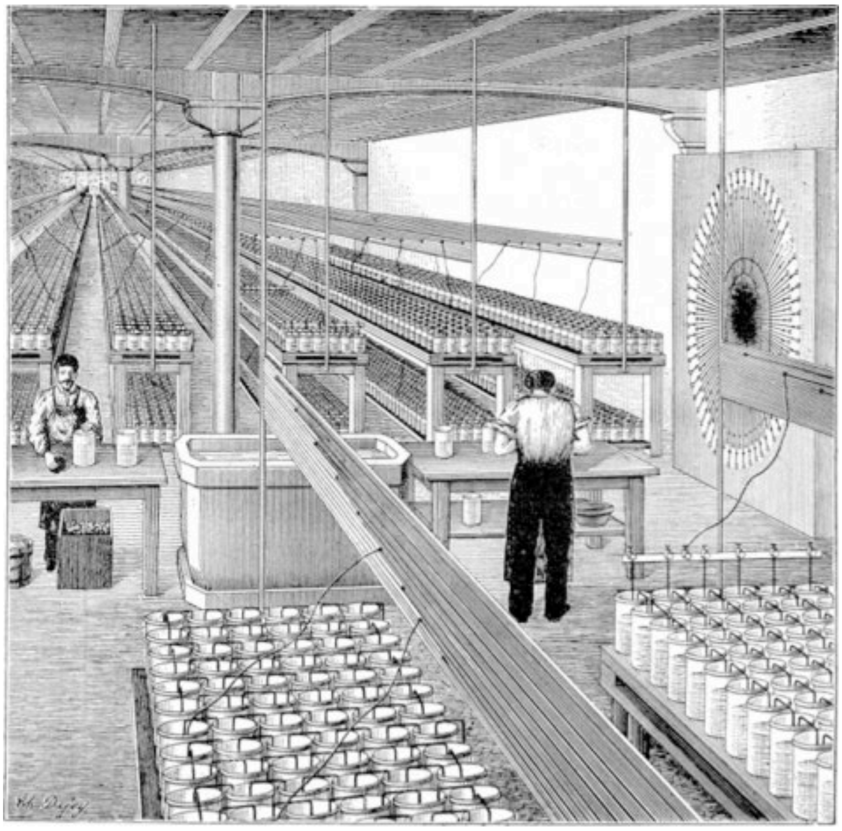
[174] Turgan (1882: 65-76) gives a detailed description of Ader's telephone receivers and transmitters.
[175] Author's translation from French: "on les renouvelle chaque quart d'heure."



[Fig. 23] Above: battery basement at l'Opéra de Paris, 1881; below: hall of the "ten thousand elements" at Direction Générale des Télégraphes.[176]

But the problem of delivering electricity did not impede the progress of auditions téléphoniques. According to French telephone collector and historian Frédéric Nibart in "La Création de la S.G.T." (2004), Ader's auditions téléphoniques were very profitable at the 1881 Exposition Internationale d'Électricité. They were a huge marketing event for the company Société Générale des Téléphones, or S.G.T. Shortly after the exposition had ended in November 1881, the company, Nibart continues, "increased its capital to 25 million francs." And it was difficult for the company to "manage the growing popularity of the telephone," which led to a situation in which the company "could no longer satisfy public demand" in telephony. On the 31st of December, 1881, "911 subscribers were impatiently waiting" for their network connection. Nibart says that the Société Générale des Téléphones "blamed these delays" on the French government's delayed construction of new telephone networks, even though they had already earlier permitted private companies like the Société Générale des Téléphones to establish the first networks since 1879 (see the map of an early Paris telephone network in Figure 24 below). Another reason for the delays, as Nibart points out further, was a shortage of network cables, which "manufacturers could not supply in sufficient quantity."

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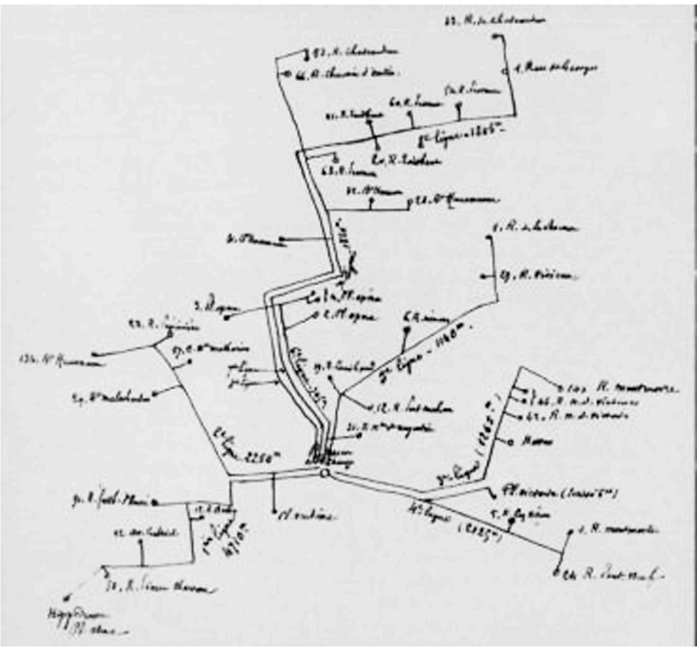
[176] Gérard Borvon (2009).

By contrast, in Germany—according to media scholar Katja Stopka in her book *Semantik des Rauschens* (2005: 157) or *Semantics of Noise*—the first telecommunications switching centre opened two years after technologically advanced Paris in Berlin in 1881—counting as many as eight network participants. Sometime later, Berlin's telephone directory listed 94 participants and went down in telephone history as the "Buch der 94 Narren" or the "Book of 94 Fools."[177] In France in early 1881, according to Nibart (2004), the Société Générale des Téléphones had already installed and operated seven telecommunication switching centres and about 300 telephone lines. The company "continued to develop its networks" across France, such as in Lille in February, 1882. In these early stages of technological development, France dominated in sound transmission. Its telephone networks, according to *La Nature* (1882), were the "most advanced of those operating in Europe and the United States."[178]



[Fig. 24] Map of Paris telephone network, Société Générale des Téléphones, early 1880s.[179]

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[177] Baumann (2000) cited in Katja Stopka's chapter (2005: 157) "Moderne Sphären des Rauschens: Speicher und Sender" (156-61) in *Semantik des Rauschens: über ein akustisches Phänomen in der deutschsprachigen Literatur*, Martin Meidenbauer Verlag, München. Margret Baumann and Helmut Gold (2000) provide a historio-cultural account of telephony in Germany (incl. Third Reich, GDR, art, film, sex, counseling, long-distance calls) in *Mensch Telefon: Aspekte telefonischer Kommunikation*, Edition Braus, Heidelberg.

[178] Author's translation from French as cited in Nibart (2004) and Borvon (2009).

[179] Frédéric Nibart (2004) "La Création de la S.G.T.," in *Société Générale des Téléphones*, available at http://fredouille.pagesperso-orange.fr/creation.htm (April 2012).

4.2.2. Being There

Auditions téléphoniques were a cause for celebration. Clément Ader staged them both at the Exposition Internationale d'Électricité in 1881, and at the Paris Exposition Universelle in 1889. The latter was a massive event with 32 million visitors. As musicologist Annegret Fauser states in her chapter "New Media, Source-Bonding, and Alienation: Listening at the 1889 Exposition Universelle" (2008) "close to 90,000 visitors" paid an extra admission fee just to enter Ader's listening rooms. His auditions téléphoniques sparked a public debate with the "central issues discussed in the press" being the new "form of acousmatic listening, where the source of the sound is invisible beyond its cause" (42-3).[180]

As auditions téléphoniques were not completely new anymore, the debates on acousmatic listening also were not new in 1889. They dated back at least several years to the 1881 Exposition Internationale d'Électricité, where auditions téléphoniques occurred for the first time in public. French physician Julian Turgan (1882) hinted at the idea of acousmatic listening by drawing an analogy with human vision. "Everyone knows the stereoscope," he begins, and further recalls how stereoscopes can make two and three-dimensional representations of the world. They create an illusion of depth; they let human beings "view images with the natural topography" of geographical space. His point is that auditions téléphoniques now achieved a similar effect not for the human eyes but for the human ears to hear sounds by telephone with the "natural topography" of that space where the sound originated (75).[181] Writing shortly after the exposition, *Scientific American* (1881) stated, based on a French journal on electricity, that Ader "discovered" a "new acoustic effect" or "auditive perspective." *Scientific American* translated the following passage originally written by engineer Édouard Hospitalier in 1881:

> We will now consider the new acoustic effect which Mr. Ader has discovered, and applied for the first time in the telephonic transmission at the Electrical Exhibition. Every one who has been fortunate enough to hear the telephones at the Palais de l'Industrie has remarked that, in

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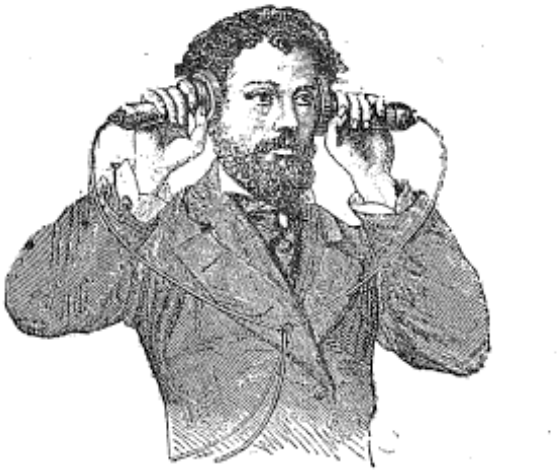
[180] More on auditions téléphoniques at 1889-Paris world exposition offers Annegret Fauser's (2005) chapter section "Listening to Music without a Source: Opera through the Telephone" (281-97), in *Musical Encounters at the 1889 Paris World's Fair.* Also, Fauser (2008: 40-8) "New Media, Source-Bonding, and Alienation: Listening at the 1889 Exposition Universelle," in *French Music, Culture, and National Identity, 1870-1939*, ed. Barbara L. Kelly. Also, Catherine Bertho-Lavenir (1989) "Innovation Technique et société du Spectacle: le Théâtrophone à l'Exposition de 1889," in *Association Le Mouvement Social*, iss. 149, pp. 59-70.

[181] Author's translation from French: "Tout le monde connaît le stéréoscope, qui permet de voir les images avec le relief naturel. C'est un effet semblable qui a lieu pour l'ouïe."

> listening with both ears at the two telephones, the sound takes a special character of relief and localization which a single receiver cannot produce. It is a common experience that, in listening at a telephone, it is practically impossible to have even a vague idea of the distance at which the person at the other end of the line appears to be. To some listeners this distance seems to be only a few yards. To others the voice apparently proceeds out of a great depth of the earth. In this case there is nothing of the kind. As soon as the experiment commences the singers place themselves, in the mind of the listener, at a fixed distance, some to the right and others to the left. It is easy to follow their movements, and to indicate exactly, each time that they change their position, the imaginary distance at which they appear to be. This phenomenon is very curious, it approximates to the theory of binauricular audition, and has never been applied, we believe, before to produce this remarkable illusion to which may almost be given the name of auditive perspective (422-3).

Hospitalier's definition of the "auditive perspective" and the "theory of binauricular audition" anticipated nothing less than what we call stereophonic sound today. What Ader created at the 1881 Paris Exposition Internationale d'Électricité was a remarkable early acousmatic listening experience. It was remarkable because stereophonic sound became widely adopted not until decades later in the 20th century. This shows that media theorist Roger Fidler (1997: 29) is right about his earlier-mentioned principle of mediamorphosis "delayed adoption." It stresses that new media inventions (such as stereophonic sound) require "at least one human generation (20-30 years) to progress from proof of concept to widespread adoption."



Position d'une personne écoutant les auditions téléphoniques
à l'Exposition d'Anvers.

[Fig. 25]: Listening to auditions téléphoniques in stereophonic sound, 1885.[182]

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[182] Mourlon (1885: 121).

To understand how Ader created this remarkable impression of stereophonic sound, let us picture once again the exhibition visitors standing inside the listening rooms. We said that the visitors applied two telephone receivers to their ears instead of only one like today. To produce stereophonic sound Ader installed, according to the technical drawing on the left in Figure 26 below, ten telephone transmitters at the Opéra de Paris before the main stage—five transmitters on the left side of the prompter box and five transmitters on the right side. In the listening rooms, visitors' left telephone receivers were connected to the transmitters on the left side of the theatre stage; the right telephone receivers to the right side of the stage. Should an actor speak or sing (for instance) in position A on the stage, then transmitter T would be closest to this actor and thus convey his or her voice more clearly to the telephone listeners than transmitter T' located farther away on stage. By contrast, should an actor speak or sing on stage in position A,' then transmitter T' would convey the sounds more clearly to the telephone listeners.

Suppose further that an actor would walk across the theatre stage from position A to position A' (see illustration on the right in Figure 26 below). In this case, the transmitters T and T' would convey sounds differently to the distant telephone listeners: While the sounds would diminish at transmitter T on stage, they would become louder at transmitter T'. Turgan (1882) commented on his own experience of auditions téléphoniques in the listening rooms: "We hear actors changing place" on stage; "we can follow their actions even through the noises of their steps." The same holds true for "actors passing" by the transmitters; and during their dialogues the telephone transmitters "secure the position of each actor perfectly" (76). In this way, the distant telephone listeners have their "two hearing organs separately impressed" in stereophonic sound—as if each ear itself would be right there in the Opéra de Paris, instead of the transmitters sitting there for the listeners (75).[183]

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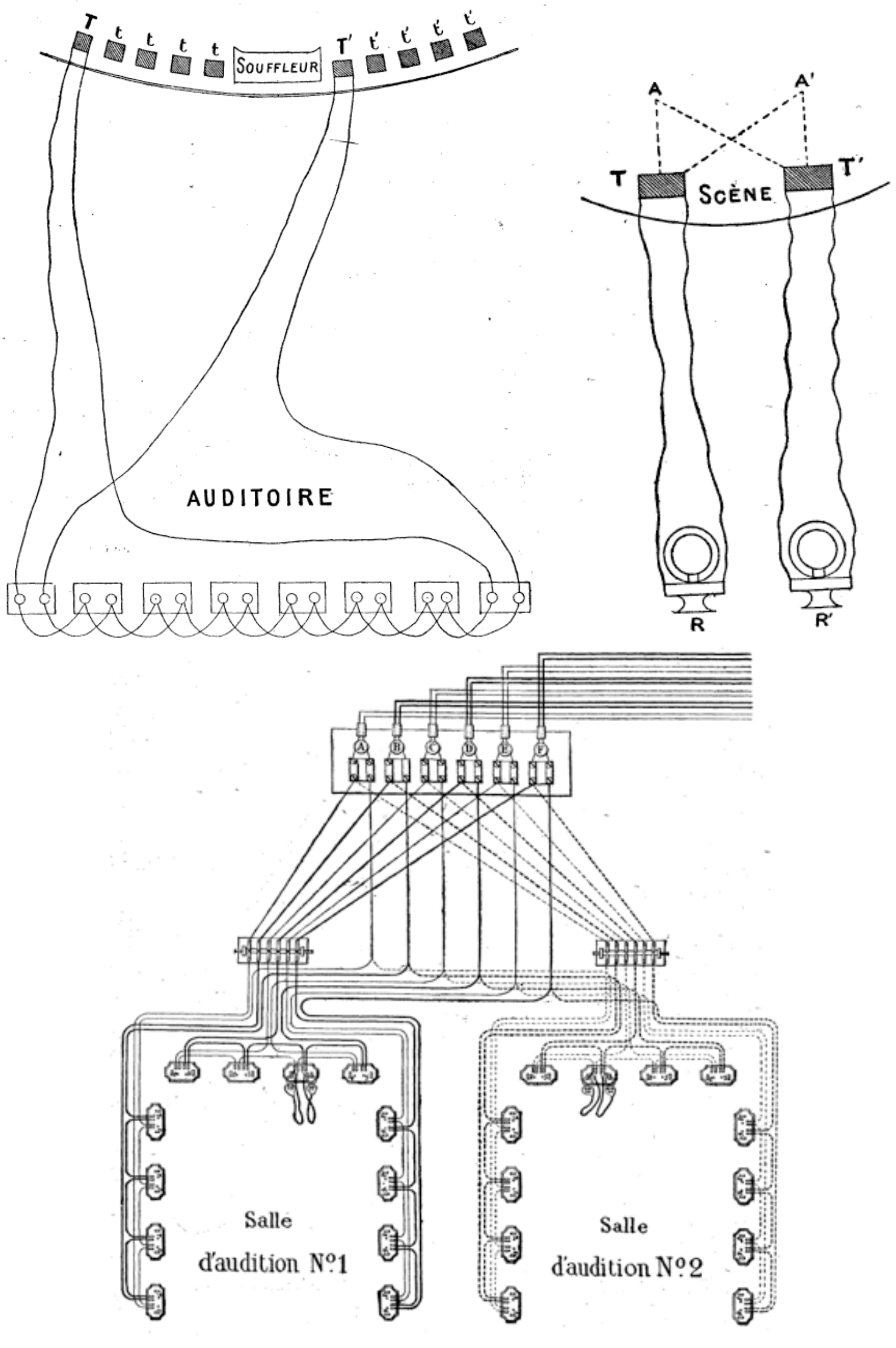
[183] Author's translation from French: "de sorte que l'auditeur éloigné de la scène a ses deux organes de l'ouïe impressionnés séparément, comme il les aurait s'il était en personne à la place du transmetteur."



[Fig. 26] These technical drawings show Ader's concept, or design for creating stereophonic sound reproduction, 1881. Top left: installation of ten transmitters (T and T') on both sides of prompter box (souffleur) on stage at the Opéra de Paris. Top right: a close-up view of actors' positions (A and A') and two transmitters (T, T') connecting two distant receivers (R, R') for stereophonic sound, left and right ear. Below: Drawing of listening rooms for auditions téléphoniques at Paris Exposition Internationale d'Électricité.[184]

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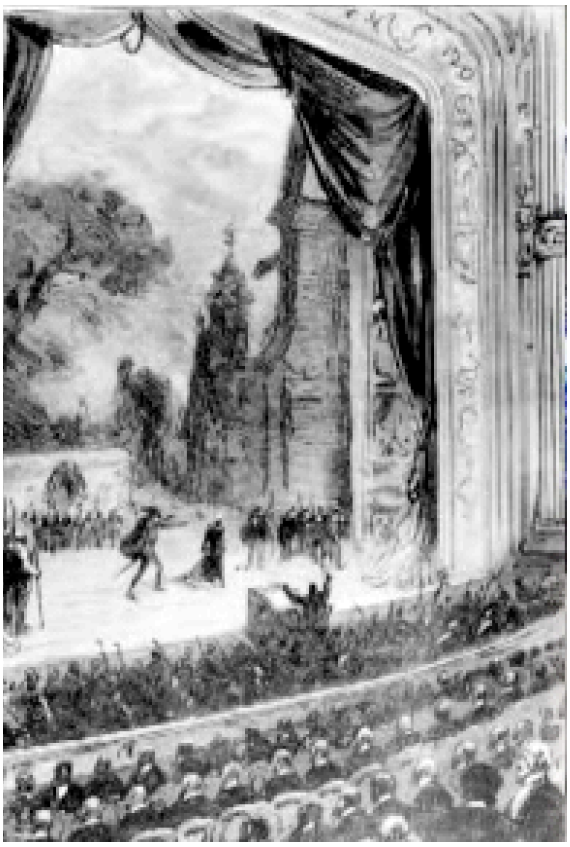
[184] Julien Turgan (1882) "Exposition Internationale D'Électricité: Auditions Théatrales" (65-76), in *Les Grandes Usines: Études Industrielles En France Et A L'Étranger*, vol. XIV, Calmann-Lévy, Paris. See also Gastons Tissandier (1881) "L'Exposition D'Électricité: Auditions Téléphoniques Théatrales Système Ader," in *La Nature*, iss. 434, September 24, pp. 257-60.

Though telephone listeners heard the Opéra de Paris with power and precision in stereophonic sound, not all of them could make sense of all they heard. Only those listeners who were familiar with performances at the Opéra de Paris could imagine themselves there. From their sensory experiences, they could recall its acoustic environment, its impressive architecture, interior decorations and paintings, and the particular smell when they entered the Opéra de Paris and sat side by side before the stage with its large curtains and the prompter's box (shown in Figure 27 below). *La Nature* (1881) recalls the "delicacy with which the sounds were transmitted" from the Opéra de Paris into the distant listening rooms: "Not only do we hear the artists, but we also recognise their voices; one distinguishes the murmurs of the audience in the auditorium; one perceives their applause."[185]



[Fig. 27] Stage and auditorium at Opéra de Paris, 1890s[186]

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[185] Author's translation from French as cited in Nibart (2004): "Il faut avoir entendu dans les téléphones de l'Exposition d'Electricité, pour se rendre exactement compte de la délicatesse avec laquelle les sons se trouvent transmis. Non seulement on entend les artistes, mais on reconnaît leur voix, on distingue les murmures du public dans la salle, on perçoit ses applaudissements."

[186] Screenshot from historian Patrice A Carré's (2007) video interview "Le Théatrophone," in "Pédagogie," *Orange Innovation TV*, France, available at http://www.orange-innovation.tv/webtv/le-theatrophone/video-102-fr (April 2012).

Turgan (1882) also comments on his listening experience to auditions téléphoniques at the 1881 Exposition Internationale d'Électricité. He writes, one could "recall the actors [on stage at the Opéra de Paris], not vaguely, as in a distant dream but as a disturbing reality." Performers "are there and sing to you in the ears. They go, they come, return; we see them by thinking as we would listen to them in reality, supported by the choirs and the orchestra. You were at the Palais de l'Industrie, and yet attended the Opéra de Paris" (68).[187] What Turgan's experience of early sound transmission already anticipated was what Pierre Schaeffer explained eight decades later in his book *Traité des Objets Musicaux* (1966: 91) as "acousmatic" listening, and, negatively, R. Murray Schafer terms "schizophonic" listening in *The New Soundscape: A Handbook for the Modern Music Teacher* (1969: 43-7).[188] We detailed in chapter 2 that both Schaeffer's acousmatic listening and Schafer's schizophonic listening draw attention to the separation of sound from its source, or origin in the face of technological reproduction.

Turgan also hints at a disembodied listening experience through sound reproduction, although he is less interested in the separation of sound from its source. What he emphasises instead are the human memory and imagination in relation to sound reproduction. As he wrote above, one can "recall the actors" by memory from previous theatrical experiences during telephone listening, so that by consciously imagining and visualising "we see them by thinking as we would listen to them in reality." Though he writes that for telephone listeners the experience of auditions téléphoniques is "not" like a "distant dream" but a "disturbing reality," these distant listeners nevertheless created their imaginary world of being at the Opéra de Paris—almost as if they would dream the event in a waking state. Hence, a powerful mixture of imagination and memories of theatrical scenes must have drawn the telephone audience into their listening experience.

At the same time, inside the listening rooms observers noticed strange reactions of telephone listeners. While enjoying the telephone music, some listeners immersed themselves in (to borrow a phrase from composer Pauline Oliveros) a state of “deep listening.”[189] They would close their eyes and concentrate on what the telephone receivers conveyed to them. They would follow the music and movements and actions of the theatre performers on stage. As soon as the listening session was over they would hang up the telephone receivers and give the theatre performers loud applause. Strangely enough, what caused this expression of approval for the performers is that the listeners had a momentary lapse of reason and forgotten that they were in the remote listening rooms at the 1881 Paris Exposition Internationale d’Électricité, as opposed to being in the Opéra’s auditorium face-to-face with the performers. The performers, of course, did not even notice the enthusiastic applause intended for them. As Fauser (2008) puts it, telephone music “causes social alienation” because the “act of applause” by the telephone listeners “is no longer an appropriate reaction, for there is no one to whom it can be reasonably addressed. The inappropriate clapping thus becomes a symbol for the dislocation between activity and space” (44-5)—hence an acousmatic or schizophonic reaction. Ader made the telephone audience feel as though they were in the Opéra de Paris. It seems neither far-sounded nor far-sighted to say that Ader invented both telephone music for the ears and television for the mind’s eye.

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[187] Author's translation from French: "Le souvenir vous rappelle les personnages, non pas vaguement, et comme dans un rêve lointain, mais bien comme une réalité troublante. Ils sont là qui vous chantent dans l'oreille. Ils vont, ils viennent, se retournent; vous les voyez par la pensée comme vous les entendez en réalité, soutenus par les choeurs et par l'orchestre. Vous étiez au palais de l'Industrie, et cependant vous assistiez à l'Opéra."

[188] See also Pierre Schaeffer's (1966 [2004]) essay "Acousmatics," in *Audio Culture: Readings in Modern Music*, eds. Christoph Cox and Daniel Warner, The Continuum International Publishing, New York.

4.2.3. Knowledge Transfer

Ader’s technological innovation of auditions téléphoniques did not appear tabula rasa—from a blank slate. He must have been well informed and known the latest developments in telephone music. In his book *La Physique Moderne: Les Principales Applications de L’Électricité* (1881), engineer Édouard Hospitalier, a contemporary and compatriot of Ader, portrays how the technological development of music transmission relates to previous inventions in electricity and telephony. His chapter “Téléphones Musicaux” (224-33) concentrates on the then-widely known Philipp Reis’s “téléphone musical” and Elisha Gray’s musical telegraph. Hospitalier mentions that Gray’s telephone receiver was based on ideas from Hermann von Helmholtz’s work *On the Sensations of Tone as a Physiological Basis for the Theory of Music* (1863). According to music critic Paul Griffiths in *Electronic Music* (1979: 14)

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[189] Pauline Oliveros (2005) *Deep Listening: A Composer’s Sound Practice.* Deep Listening Publications, Lincoln, Nebraska.

Helmholtz's theory "laid the foundations of modern acoustics." In *Electronic and Experimental Music* (2008), Thom Holmes explains, "the Helmholtz theory suggested that sound could be analysed by its component parts and led directly to the engineering of electronic means for synthesizing sound, first in the form of Cahill's Telharmonium" (174) using telephone networks for music in the 1890s.[190]

Yet some of the earliest knowledge in telephone music, Hospitalier grants to American electrical engineer Charles Grafton Page. He founded "musique galvanique" in the 1830s."[191] Musique galvanique was musical vibrations produced by small electrical impulses (galvanic currents). Page named it after Luigi Galvani, who is credited with discovering electricity in the late 18th century (Galvani proved that the natural electricity in animals is the same electricity applied in scientific experiments of sound—hence musique galvanique). Hospitalier describes how Page's musique galvanique then influenced several other scientists and technology inventors. Among them are Swiss physicist Auguste Arthur de la Rive in his electrical studies *Traité D'Électricité Théorique et Appliquée* (1854) as well as Édouard-Léon Scott, a French bookseller and inventor who predated, in part, Edison's 1877-phonograph by about two decades with Scott's sound inscription machine named "phonautographe" in 1853.[192] Page's musique galvanique also inspired British Alexander Graham Bell (who was not just committed to telephone music, although he staged telephone concerts such as noted earlier, in Canada, 1876). Bell was the one who, in turn, influenced Clément Ader's invention of telephone music. Turgan (1882) notes that Ader "imagined, investigated and realised … a complete system" for musical transmission that directly or vertically built on, as writer G. Mareschal (1892) clarifies, "Bell's telephone system" (55-9). In other words, Ader entered a larger arena of the development of telephony. He used, modified, extended, and improved existing concepts of technology to bring forth auditions téléphoniques.

It is notable that in the historical process of the emergence of telephone music, its underlying concepts of technology already circulated far and wide. How did this knowledge transfer result? How did telephone inventors influence one another back then? In answer to this, on the one hand we have seen that massive world expositions, international trade fairs, and specialised technology events such as the Paris Exposition Internationale d'Électricité—bringing together inventors, scientists, entrepreneurs, journalists, and public visitors—fuelled and globally propelled a rapid knowledge transfer among rival groups of inventors, businesspersons, scholars, and technology manufacturers in the late-19th century.[193] (By extension, chapter 5 provides interviews with current manufacturers of digital music technologies conducted at the NAMM Show, an international trade fair in Anaheim, California).

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[190] Besides Helmholtz influencing Thaddeus Cahill, Holmes (2002: 13-4) also notes how Cahill's Telharmonium or Dynamophone (not Dynaphone) inspired in turn later electronic synthesiser inventions of the 20th century. See also Reynold Weidenaar (1995) *Magic Music from the Telharmonium*, Scarecrow, Metuchen, New Jersey. Also, Peter Manning's (2004) chapter on electronic music "The Background to 1945" (3-16), Hagen (2009), Sterne (2003: 192-4), Holmes (2002: 44-52), Rohrhuber (2007: 140-56).

[191] See also George Prescott's (1879) chapter on the "History of the Production of Galvanic Music" (110-51) in *The Speaking Telephone, Electric Light and Other Recent Electrical Inventions*, D. Appleton & Company, New York.

[192] On phonograph entertainment writes Lisa Gitelman (2003) "How Users Define New Media: A History of the Amusement Phonograph" (61-81), in David Thorburn and Henry Jenkins, *Rethinking Media Change: The Aesthetics of Transition*, MIT, Cambridge, Massachusetts.

On the other hand, aside from international trade fairs various publications such as books, magazines, and scientific journals frequently reported on the state-of-the-art technologies in distant communications and telephone music in the late 19th century. In France alone, some of the electrical journals include the *Journal Télégraphique*, *L'Électricité*, *L'Électricien*, *La Lumière Électrique*, *Les Nouveautés Électriques,* and *L'Industrie Électrique*. Other popular French publications that reported on telephone music were *Le Monde Illustré*, *L'Illustration*, *Le Figaro,* and *La Nature*. In addition, some of the electrical journals outside of France included the *Electrical Engineer*, *Electrician*, *Electrical Review* and *Electrical World*. For instance, *The American Journal of Science and Arts* already reported on Page's foundational 1830s experiments of musique galvanique.[194] The innovation of telephone music, then, was largely powered by large trade fairs and widely circulating publications, encouraging competition and a global knowledge transfer before the turn of the 20th century. Technical schools, universities, and self-study also played a role. Social philosopher Joachim Koch (2001: 24) describes the developments then in a broader historical context: "The markets became international, the economy became independent" in the 1800s.[195]

With a rapid international transfer of knowledge, it follows logically that the more nations operate on a similar level of knowledge, the more likely it is for the people in these nations to come up with similar ideas for new technological inventions or adaptations of them. Thus it is likely that other inventors could have achieved technological results comparable to Ader's auditions téléphoniques. Besides Ader and other international telephone inventors, the 1881 Paris Exposition Internationale d'Électricité also displayed telephones from Edison, Bell, Frederic Allan Gower, Francis Blake, Louis John Crossley, and George May Phelps'. (His widely used "crown" telephone handset is shown among other telephone devices in Figure 28, below.[196]) What this suggests is that inventors' ideas for the construction of technology are usually in accord with the scientific fields in which the inventors engage. Helmholtz inspired Bell, who in turn, inspired Ader, and so on. As Michael Chanan (1995) explains, "inventions never just appear out of a vacuum in the mind of the inventor, and there are usually several inventors at work simultaneously on similar endeavours, sometimes in competition and sometimes in ignorance of each other" (2) like the creation of art as a whole.

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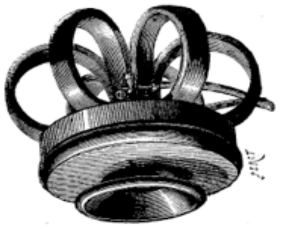
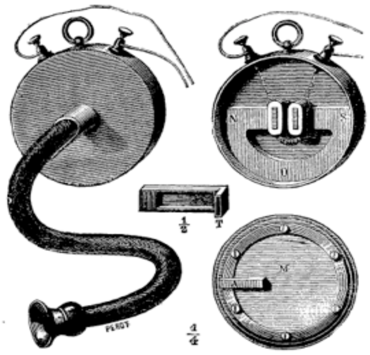
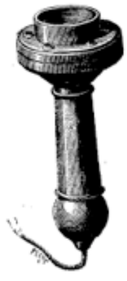
[193] A comprehensive "List of World's Fairs" from the First Exhibition in London (1756) to the future 2020s-exhibitions is available at http://en.wikipedia.org/ wiki/List_of_world%27s_fairs. Note, there exist other types of international trade fairs such as the NAMM show excluded from this list.

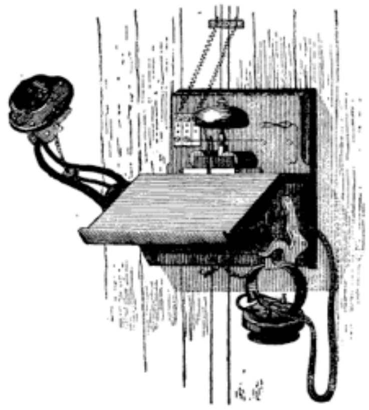
[194] Frank Luther Mott's (1938) chapters "Scientific, Technical, and Trade Journals" (104-37) and "Music, Theater, and Sports" (192-220), in *A History of American Magazines, 1865-1885*, Harvard University Press, Cambridge, Massachusetts analyse 1800s-American magazines on art and technology. Stange (1985) compares "Two Electrical Periodicals: The Electrician and The Electrical Review 1880-1890," *Proceedings of the IEE*, vol. 132, pp. 574-81.

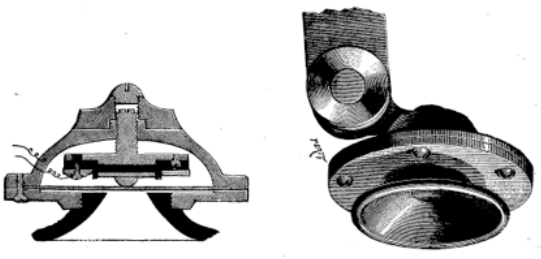
[195] Author's translation from Koch's German book title: *Megaphilsophie: Das Freiheitsversprechen der Ökonomie*. Quote: "Die Märkte wurden international, die Ökonomie machte sich selbständig."


Téléphone dit Crown.


Téléphone Gower.


Téléphone Bell.


Téléphone Edison.


Transmetteur Edison.

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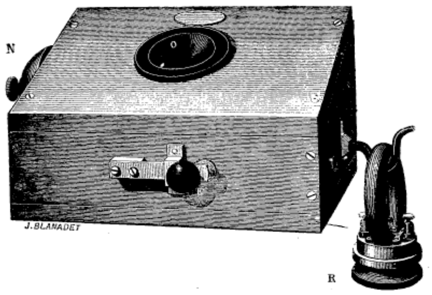
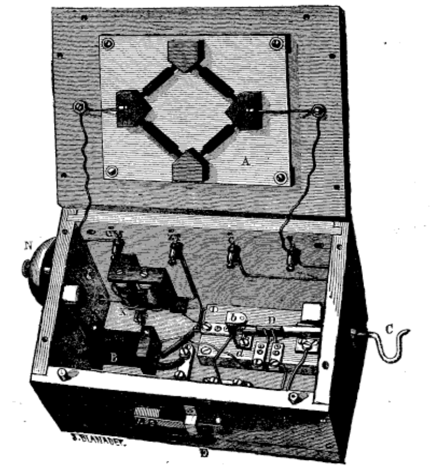
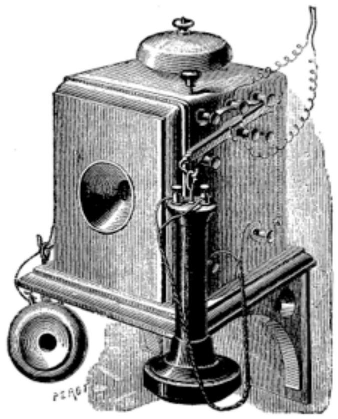
[196] For an extended description on 1800s-telephony, see George Prescott (1884 [1972]) in *Bell's Electric Speaking Telephone: Its Invention, Construction, Application, Modification, and History*, reprinted by Arno Press, New York.



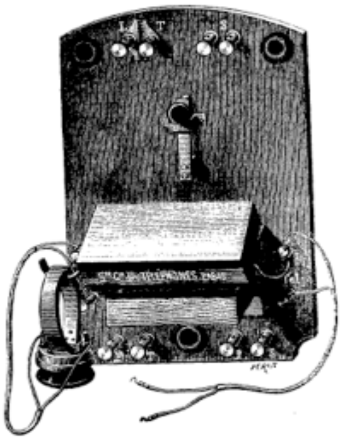
Téléphone Crossley.



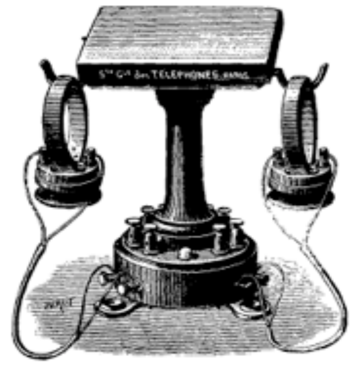
Téléphone Crossley, intérieur.



Téléphone Blake.



Téléphone Ader fixe.



Téléphone Ader mobile

[Fig. 28] Telephones at Paris Exposition Internationale d'Électricité, 1881.[197]

However, an objectified vertical transfer of knowledge is not the only cause for technological development. By "vertical" I mean knowledge transfers where technological results, concepts and objects, or parts of them directly, top-down, or vertically, build on previous technological results. This process has been objectively measured by third parties. Also, Ader's auditions téléphoniques were characteristic of a vertical knowledge transfer because Ader had, as we saw above, "investigated" and scientifically founded his inventions on “Bell’s” existing “telephone system.” “Inventions are,” as engineer James L. Adams (2001: 135) correctly defines them, “merely new ways of combining old bits and pieces.” However, we also saw that Ader had “imagined” beforehand his auditions téléphoniques. “By imagination,” to recall James Champlin Fernald (1896) from chapter 2 on transformations in music culture and technology, “the architect sees the unity of a building not yet begun, and the inventor sees the unity and varied interactions of a machine never yet constructed, even a unity that no human eye ever can see, since when the machine is in actual motion, one part may hide the connecting parts, and yet all keep the unity of the inventor’s thought.” Michael Chanan (1995) would add to Fernald’s observation that it is also “social, economic, and cultural circumstances [that] motivate the invention and the direction of the inventor’s imagination” (2). In this way, Ader extended the technological concept of telephony to the transmission of theatrical plays.

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[197] Pictures taken from Turgan's (1882) chapter section "La Téléphonie" (45-65).

Chanan’s above point is noteworthy because it hints that besides a mere vertical transfer of knowledge, technological innovation also involves what we may call a horizontal transfer of ideas. Instead of a straight-line following of previous technologies, the horizontal transfer of ideas indirectly hints at the origins of technologies through different combinations of previously unrelated ideas in the social, economic, and cultural sphere. A horizontal transfer of knowledge happens somewhat obscurely, for it is difficult for others to reverse engineer, or probe the depths of an inventor’s mind, imagination, and creativity in connection to the inventor’s surroundings. Only with the benefit of additional details such as the sociocultural living conditions of the inventor, biographical data, personal diaries, and maybe even his or her relevant exchange of letters among like-minded people, is it at all possible to detect some underlying causes and trains of thought involved in the genesis of a technology. Again, it is a matter of the “social, cultural and economic circumstances” that inspire and motivate an inventor to get moving and imagine the “unity” of things not yet constructed.

It follows, then, that together the vertical and the horizontal transfer of knowledge eventually create a larger circular or systemic dynamic that supports and leads to technological innovation. Auditions téléphoniques reflected this systemic dynamic, because the inventors proceeded from science and technology and also drew on a cultural sphere previously unrelated to that technology. Put differently, Ader would not have been able to imagine the unity of the theatre and the telephone without other groups of people having contributed to these domains beforehand. That is why technological innovation such as telephone music involves not just individual inventors, but almost always happens systemically with the interaction of the whole social symphony.

4.3. Diffusion of Telephone Music (1890s)

4.3.1. Compagnie du Théâtrophone

On February 25, 2010, Steve Jobs of Apple, Inc. called 71-year-old Louie Sulcer of Woodstock, Georgia, on the telephone and told him, "Congratulations, Lou!" for downloading the ten billionth iTunes song. It was Johnny Cash's "Guess Things Happen That Way." For Sulcer, Apple had "another surprise … a call from Roseanne Cash, Johnny's daughter. Her backup guitarist and husband played 'Guess Things Happen That Way,' for him over the phone." Sulcer also received a $10,000 iTunes subscription prize.[198]

"With a subscription to one of the various musical companies that are currently in vogue," wrote French journalist G. Mareschal in the science magazine *La Nature* about 120 years earlier in 1892, "...we receive the supply of music for our children" (55).[199] Here, Mareschal echoes the words of French novelist Albert Robida from his then ten-year-old science fiction classic *The Twentieth Century* (1882).[200] Mareschal's point is that people of the 1890s did not have to wait long for Robida's 20th century to materialise. Telephone music and subscription services had already come into being in the 1890s.

Mareschal (1892) says, in drawing an analogy to sound, "If now we cannot foresee the time when we will ever see by wire what happens to a remote location in the world, we all know that the telephone already allows us to hear sound, and to articulate the full speech" at a distance (55).[201] What he alluded to was a special telephone service in Paris that would enable, according to Fauser (2008), distant "musical consumption with a commercial future" (46). Already during Ader's auditions téléphoniques at the 1889 World Exposition, he found competition from two other innovative entrepreneurs. They installed their own patented telephone system across Paris to pipe theatre performances to distant audiences, based on a different technological concept than Ader's auditions téléphoniques. For marketing purposes, the entrepreneurs shortened the name of their new telephone theatre to "théâtrophone." Both the 32-year-old Serbian mechanical engineer Bélisaire Marinovitch and the 33-year-old French electrical engineer Geza Szarvady (son of Czech pianist Wilhelmine Clauss-Szarvady and Hungarian diplomat Frigyes Szarvady) were clever entrepreneurs and the main people behind the start-up company called Compagnie du Théâtrophone, founded in 1889.[202] On August 23, 1889, *The Telegraphic Journal* brought to public attention, "the objects of the company are the working in France and abroad of a system of telephonic performances by means of an automatic apparatus patented in France in the names of the above gentlemen" (201) Marinovitch and Szarvady.

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[198] Erika Neldner (2010) "Woodstock Man Wins $10,000 iTunes Prize," in *The Cherokee Ledger-News*, available at http://www.ledgernews.com/news/491-march-3-2010/1672-woodstock-man-wins-10000-itunes-prize (April 2012).

[199] Author's translation from French: "Plus de musiciens, plus d'orchestre dans les salons de notre temps pour les concerts ou pour les bals, économie de place, économie d`argent. Avec un abonnement à l'une des diverses compagnies musicales qui ont actuellement la vogue, on reçoit par les fils sa provision musicale."

[200] See Albert Robida (1882 [2004]) *The Twentieth Century*, ed. Arthur B. Evans, trans. Philippe Willems. Wesleyan University Press, Middletown, Connecticut. Robida's trilogy further consisted of the two untranslated books *War in the Twentieth Century* (1887), and *The Twentieth Century: Electrical Life* (1890).

Marinovitch and Szarvady put into operation a sound transmission network to transmit live performances regularly from popular theatres in Paris to distant audiences within Paris and its suburbs. Eight different theatre stages fed the transmission network with live performances: Ópera de París, Théâtre des Bouffées-Parisiennes, Théâtre des Variétés, l'Opéra-Comique, Théâtre Français (Comédie-Française), Théâtre des Nouveautés, Théâtre de la Scala, and Théâtre du Châtelet along with its symphony orchestra Concerts Colonne. On the other side of the transmission network was the audience who listened by telephone to the scenes and symphonies that the theatres supplied. Listening spaces involved private telephones at homes and public listening spaces such as modern cafes, clubs, bars, hotel lounges, restaurants, and public squares (see Figure 30 further below). The théâtrophone was still a novelty abroad several years after the launch of the Compagnie du Théâtrophone. A Paris correspondent of *Electrical Review* (1891) drew an analogy between the familiar phonograph and the new théâtrophone:

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[201] Author's translation from French: "Si actuellement on ne peut encore guère prévoir l'époque à laquelle il nous sera donné de voir, par l'intermédiaire d'un fil, ce qui se passe à un endroit éloigné du globe, nous savons tous que le téléphone nous permet, dans ces conditions, d'entendre non seulement des sons, mais la parole articulée."

[202] Most sources mistakenly claim the Compagnie du Théâtrophone was found in 1890 such as Christian Brochand (1994: 377) *Histoire Générale de la Radio et de la Télévision en France*, vol. 1, Documentation Française, Paris.

> I want to tell you about a machine they use here [in Paris] very much, but that I have not seen anything of in our country. They call it the theatrophone. It is virtually a phonograph that is placed in any hotel and connected with all the theatres. By dropping the familiar coin into the equally familiar slot, the thing is set in working order, and the conversation, music, etc., of whatever theatre it happens to be connected with at the time, is plainly heard by placing two receivers to the ears. They usually connect them with the opera, Bouffées-Parisiennes, etc., and with all the theatres that have music. When the curtain rises the machine receives its impression for thirty minutes, say, and is then switched off to another theatre. An indicator shows you what is going on at any time and you can choose what you wish. It is very ingenious; certainly more amusing than the weighing machines and pull-testers that so overcrowd our waiting-rooms everywhere (4).[203]

What the *Electrical Review* correspondent hints at in this passage are the differences between two central media of sound already used in the late-19th century: sound storage and sound transmission media. Despite the differences between the main agents of these sound media back then, that is, the phonograph and the théâtrophone, what the correspondent also hints at is where these two media converge in functionality. To take a closer look at these functionalities, particularly of the théâtrophone, let us consider the types of théâtrophones that the Compagnie du Théâtrophone supplied to distant music listeners.

The company offered two types of sound transmission media: automatic théâtrophones and subscription théâtrophones. First, automatic théâtrophones (see Figure 29 below) were vending machines like jukeboxes located in public spaces. To buy music from an automatic théâtrophone, consumers had to put the "familiar coin" into the "familiar slot." In other words, the functionality of phonographs as nickel-in-slot machines had already passed on to the sound transmission medium automatic théâtrophone. Whereas coin-operated phonographs played back recorded music from wax cylinders, automatic théâtrophones transmitted music live from Paris' stages. While ten minutes of piped live music cost one franc in 1892, five minutes cost 50 centimes.[204] In his book *Les Nouveautés Électriques* (1896), Julien Lefèvre notes a mechanical “clockwork mechanism” on automatic théâtrophones that showed listeners “how many minutes had already elapsed” (390).[205]

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[203] *Electrical Review* (1891) passage reprinted in Thomas H. White (2003) "United States Early Radio History," available at http://earlyradiohistory.us/1891thea.htm (April 2012).

[204] In 1881, a male worker in Lyon earned 4.85 francs per day, whereas a female worker in the shoe manufacturing 2.10 francs and a child in the wool production 0.75 francs; see Christophe Charle (1991) *Histoire Sociale de la France au XIXe Siècle* cited in Heinrich Raatschen (2005: 189) *Die technische und kulturelle Erfindung des Fernsehens in den Jahren 1877-1882*, PhD Thesis, Philosophische Fakultät, Heinrich-Heine-Universität, Düsseldorf.

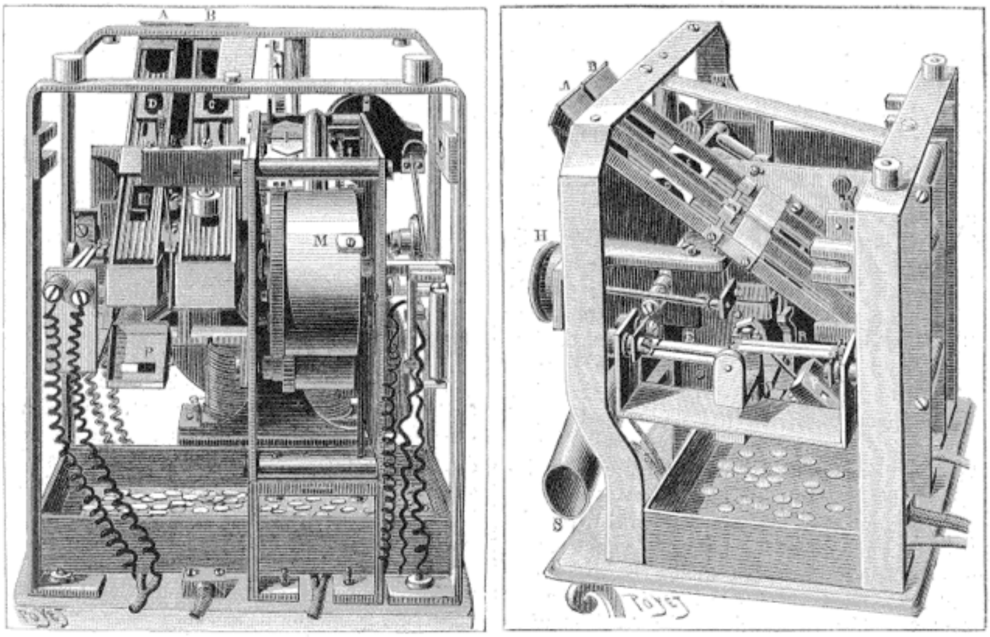

Fig. 4. — Appareil automatique pour les auditions théâtrales. (Vue de face.)

Fig. 5. — Appareil automatique pour les auditions théâtrales. (Vue de côté.)

[Fig. 29] Inside view of automatic théâtrophone, 1892.[206]

However, there was also a problem with automatic théâtrophones. Since anybody in a public space who put a coin into one was entitled to five or ten minutes of distant listening, as Lefèvre (1896) comments, a problem for the distant listeners was that often “all theatres of the network” had intermission simultaneously and thus could not supply any music. In an effort to overcome this problem, the Compagnie du Théâtrophone provided consumers during theatre intermissions with their own live music by “a pianist and a singer” who had a performance space at the company premises from where they fed “all théâtrophone lines.” To inform consumers of theatre intermissions, automatic théâtrophones had a mechanical needle indicator that robotically pointed, when appropriate, to the word “intermission” (392). Even though automatic théâtrophones were of course sound transmission media, in a sense, they were also sound storage media for their mechanical resemblances to coin-operated phonographs. As phonography and telephony historically emerged and separated from the medium of telegraphy, now telephony and phonography converged in the medium of the automatic théâtrophone.

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[205] Authors translation from French. Lefèvre’s (1896) chapter “Téléphonie” (383-95) provides more on théâtrophones. On automatic théâtrophones, see Gert J. Almind (2010) “Coin-Op Telephone Line Music,” in *Danish Jukebox Archives*, available at http://juke-box.dk/ (April 2012).

[206] G. Mareschal (1892: 52) “Le Théatrophone,” in *La Nature*, vol. 20, iss. 992, pp. 55-8.

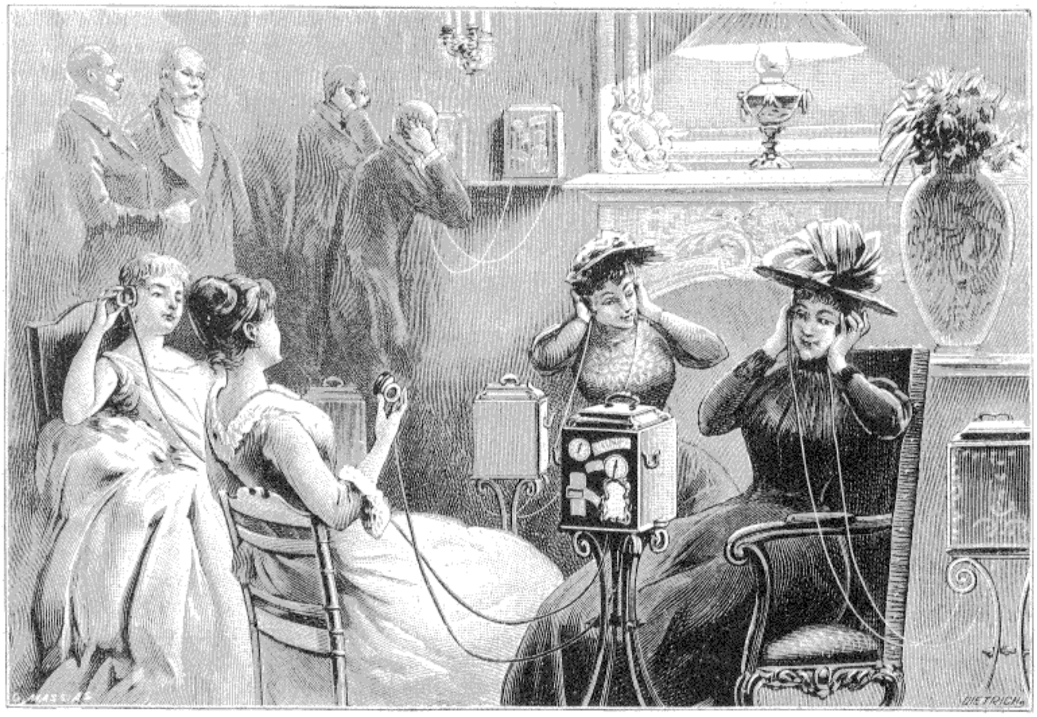

Fig. 1 — Audition du théâtrophone dans le salon d'un grand hôtel de Paris. — Aspect extérieur de l'appareil.

[Fig. 30] A public listening space of automatic théâtrophones in a Paris hotel, 1892.[207]

A second type of sound transmission media that the company offered was the subscription théâtrophone. Subscription théâtrophones foresaw even more so the modern consumption of music, since they supplied music at a flat rate like on the Internet today. In 1896, according to Lefèvre, for an "additional subscription fee" of "180 francs per year, subscribers to the telephone network in Paris and suburbs could listen to various theatre performances through their regular telephone at home" (385).[208] By contrast, 180 francs with automatic théâtrophones in public spaces would last for a total of only 30 hours of distance music per year, or five minutes per day. Subscription théâtrophones thus provided more music for the same price than automatic théâtrophones, as subscription théâtrophones were not bound to the coin mechanism. Then again, a théâtrophone advertisement in Figure 31 below—provided by Swiss engineer Pierre Zweiacker tracing early cultural developments of electricity in *Fluide Vital: Contes de l'Ére Électrique* (2005)—reveals that théâtrophone services had meanwhile changed, and the "subscription price for three people to have daily hearings [was already] 60 francs per month" (173).[209] Subscription prices for telephone music flat rates thus increased by four times to 720 francs per year for three people, or 240 francs per person—60 francs more than before.

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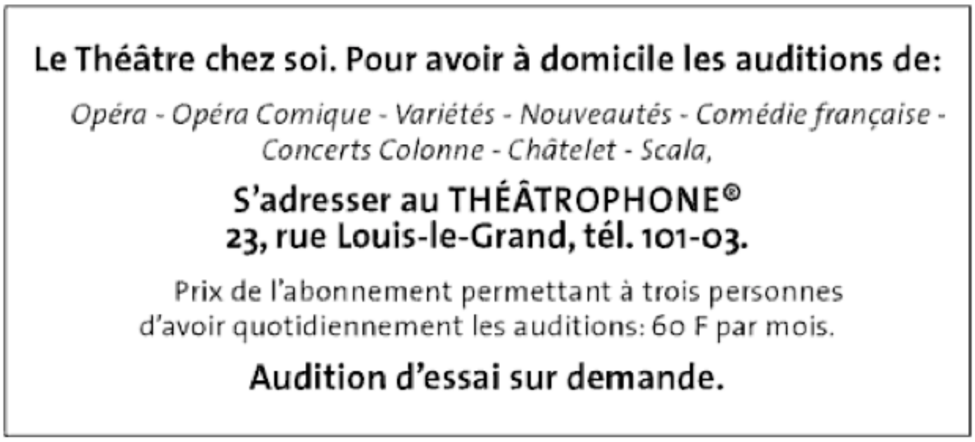
[207] Mareschal (1892: 56).

[208] Author's translation from French: "Moyennant un abonnement supplémentaire, fixé actuellement à 180 francs par an, les abonnés au réseau téléphonique de Paris et de la banlieue peuvent entendre à domicile les représentations des divers théâtres de Paris, au moyen de leurs appareils téléphoniques ordinaires."



Le Théâtre chez soi. Pour avoir à domicile les auditions de:

Opéra - Opéra Comique - Variétés - Nouveautés - Comédie française - Concerts Colonne - Châtelet - Scala,

S'adresser au THÉÂTROPHONE®
23, rue Louis-le-Grand, tél. 101-03.

Prix de l'abonnement permettant à trois personnes d'avoir quotidiennement les auditions: 60 F par mois.

Audition d'essai sur demande.

[Fig. 31] Paris Théâtrophone advertisement (translation): "The theater at home. To have at home the performances of Ópera, Opéra-Comique, Variétés, Nouveautés, Comédie-Française, Concerts Colonne, Châtelet, Scala. Inquire at the Théâtrophone 23, Louis-le-Grand Street, phone: 101-03. Price of a season ticket for three people to obtain daily auditions: 60 francs per month. Test audition upon request."[210]

What this advertisement also shows is how people could sign up for live entertainment by the Compagnie du Théâtrophone in Paris. If they called the company's telephone number "101-03," they could choose a distant listening "test upon request." Once a listener decided to sign up, as musicologist Karl Traugott Goldbach (2005) notes, the théâtrophone subscription service was almost like an "ancestor of modern pay TV" in that to enjoy distant entertainment "one had to pay via telephone bill" (238). A difference is of course that modern pay TV transmits entertainment anytime during the day, whereas subscription théâtrophones transmitted entertainment primarily in the evenings or during the opening hours of Paris theatres. Telephone listeners thus had to know the programme of entertainment of the theatres they chose to attend by telephone. In that sense, subscription théâtrophones were both an ancestor of modern subscription-based media and of modern programme-based media such as radio. As Mareschal (1892) remarks, now people can “listen to the entire modern repertoire” by telephone without ever setting a foot in a theatre.

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[209] Author's translation from French.

[210] Author's translation of French. Advertisement in Pierre Zweiacker's (2005: 172) "Le monde électrique" (147-81) where he writes on "Le dressage facile-Théâtrophone," in *Fluide Vital: Contes de l'Ére Électrique*, Presses Polytechniques et Universitaires Romandes, Lausanne, Switzerland.

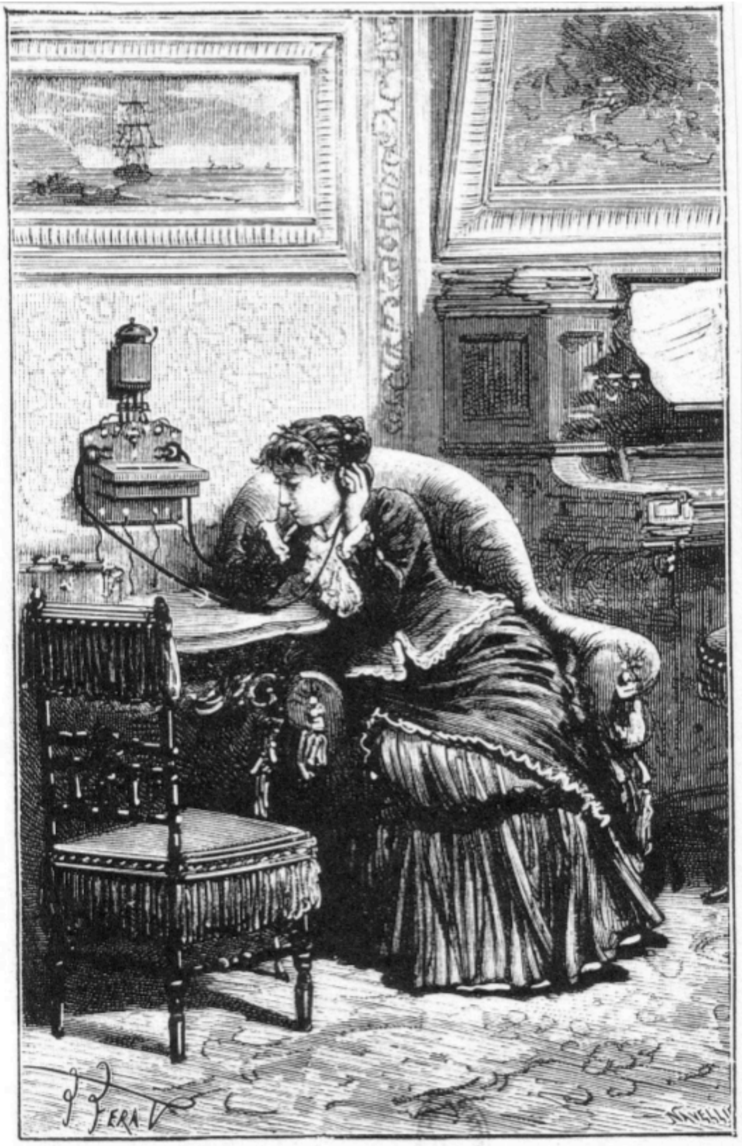

FIG. 76. — L'OPÉRA A DOMICILE.

[Fig. 32] Woman listening to theatre at home in the mid-1880s.[211]

“If this is not the Twentieth Century, it is well the end of the century,” Mareschal (1892: 55) says in referring to Albert Robida’s earlier-mentioned science fiction vision of musical subscription services in the 20th century. In other words, Mareschal was saying the technology described by Robida was alread extant in the late-19th century. These developments lasted about ten years—between 1882, when Robida first envisioned the future of musical subscription services, and 1892 when Mareschal published his *La Nature* article “Le Théatrophone.” That same year, the Compagnie du Théâtrophone had brought Robida’s vision of musical subscription services into reality. But what Mareschal overlooks is that the founders of the Compagnie du Théâtrophone, Marinovitch and Szarvady, had already made first executive arrangements for a “regular music service” by telephone (Turgan 1882: 76) as early as 1882. This was when Albert Robida published the first volume of his science fiction trilogy *The Twentieth Century*. Writer Albert Marimer (1896) in his article “The Theatrophone” also stated that Marinovitch and Szarvady’s arrangements for a music service date back to 1882: It “is the original invention of Marinovitch & Szarvady (1882) and has since been constantly improved upon” (111).

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[211] Raatschen (2005: 166). Original source: Louis Figuier (1885) *Le Téléphone,* Librairie Illustrée, Paris.

Eight years before Marinovitch and Szarvady’s launch of the Compagnie du Théâtrophone, *Scientific American* (1881) reported that Ader’s “experiments” in telephone music had partly failed. His attempts to link the Théâtre Français with the distant listening rooms at the Exposition Internationale d’Électricité had “not been successful” because on the stage of Théâtre Français the “footlights create a powerful upward current and interfere with the vibrations to the transmitters” (423).[212] Hence, Marinovitch and Szarvady “improved” telephone music. They must have solved Ader’s electrical engineering problems, since the Compagnie du Théâtrophone was able to regularly schedule live performances, including those from the previously unconnected Théâtre Français. So Ader’s auditions téléphoniques created quite a stir at the Paris Exposition in 1881, when the technology was in its infancy. But the sound medium left behind its early, experimental past with the establishment of the Compagnie du Théâtrophone. Marinovitch and Szarvady commercially moved telephone music from trade fair grounds to private and public listening spaces.

In a sense, Marinovitch and Szarvady’s Compagnie du Théâtrophone bypassed the record industry and radio transmission in the 20th century, because their subscription services presaged the 21st-century practice of musical subscription services on the Internet. As contemporary record producer and composer Albhy Galuten said in an interview with David Battino and Kelli Richards (2005) on the future of digital music, “I think that eventually music subscription services will be a great choice for most people. But that will require some sort of intelligent mechanism”

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[212] *Scientific American* (1881) article reprinted in Thomas H. White (2003) “United States Early Radio History,” available at http://earlyradiohistory.us/1881opr.htm (April 2012).

(245). Had radio music not superseded telephone music in the 20th century, then, instead of Steve Jobs, perhaps one of Marinovitch or Szarvady's grandchildren would have granted the musical subscription prize to Louie Sulcer of Woodstock for receiving the ten billionth iTunes song "Guess Things Happen That Way" over telephone networks. [213]

4.3.2. Female Network Control

The théâtrophone network was hierarchical and under female control. It connected theatre performance spaces with distant listening spaces by a central control unit or network hub called the Bureau Central du Théâtrophone. It was located in France's cultural nerve centre, in the heart of Paris on Rue Louis-Le-Grand, 23 in a basement. Inside this basement two sizable electric wall lamps shed light on a large switchboard mounted on the wall, at which a young female telephone operator sat (see Figure 33 below). As critic Brenda Maddox (1976) puts it: "A woman's place is at the switchboard … the introduction of the telephone created the first major job opportunity for women outside the factory and domestic service." Maddox finds, "a hundred years later it is still a female-dominated industry—because it allows employees to work odd hours and part-time" (614).[214] Similarly, the young woman of the Bureau Central du Théâtrophone worked part-time in 1892. She started at eight o'clock at night, when other Parisians had finished their work and longed for some theatre performances in the city. And there were also those Parisians who preferred listening to some theatre at home.

It was the female operator's job to link these home theatre listeners to Paris' entertainment scene by telephone. In the Bureau Central du Théâtrophone, she would frequently move electric cable plugs located on the switchboard before her to allow distant communications among telephone participants, and to tune in their preferred performances on Paris stages. She operated several technological devices and control units of electrical and mechanical nature. On her left was a large opening in the wall—of what looks like a circular shaped or round, upright weaving loom—

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[213] See Tim Crook's (1999) chapter "The Electrophone or Théâtrophone: broadcasting audio drama before the radio" (15-21) in *Radio Drama: Theory and Practice*, Routledge, London and New York. Also, Danièle Laster (1983) "Splendeurs et Misères du Théâtrophone," in *Romantisme*, vol. 13, iss. 41, pp. 74-8. Further, Pisano (2012: 80-98).

[214] Cécile Trévou (1998) writes on early female telephone operators in *Les Dames de la Poste*, France-Empire, Paris.

strung with various cables into a webbing or meshwork of cables, merging at the centre into a single cable tunnel. The outer rim of the loom was equipped with different splitters, connection bolts, and electrical circuits. In French, this opening in the wall was the so-called “rosace des lignes du théâtrophone” (Lefèvre 1996: 386). Besides the telephone switchboard itself, the “rosace des lignes” was probably one of the most powerful technological devices at the Bureau Central du Théâtrophone. It was the company’s electronic network hub, where all transmission cables merged and routed into the upper floors of the building, and from there spanned across the city.

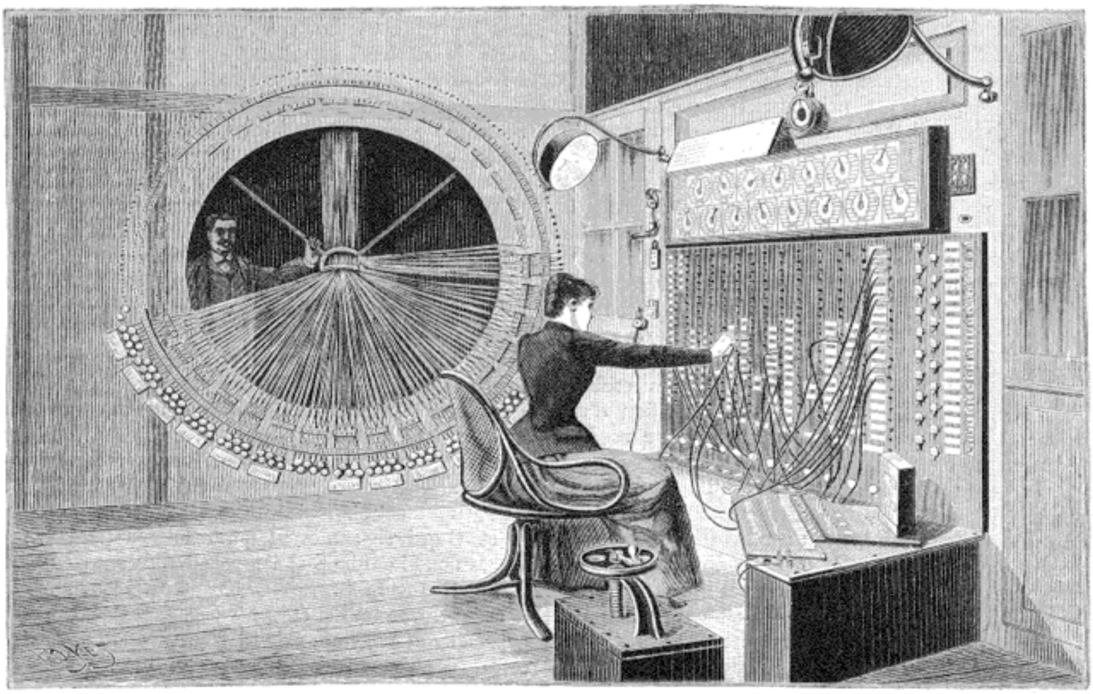

Fig. 5. — Bureau central du théâtrophone, à Paris.

[Fig. 33] Woman at Bureau Central du Théâtrophone, Paris, 1892.[215]

Outside the Bureau Central du Théâtrophone, the company organised its transmission network into a star-shaped pattern (illustrated in Figure 35 further below). Mareschal (1892: 55) and Lefèvre (1896: 386-8) describe four different théâtrophone transmission lines.[216] A first transmission line linked the Bureau with various Paris theatres, powered by Leclanché, Lalande, and Champeron batteries in the theatres. A second and special transmission line connected, to provide its daily hearings, the Bureau with the French state office, or Bureau de l’Etat at the Avenue de l'Opéra in Paris. A third transmission line served subscription théâtrophones in private homes by linking the Bureau Central du Théâtrophone to the public telephone networks of the French state. For these networks, other female telephone operators made the connections at the Paris Bureau Central Téléphonique (Figure 34), a post office in the Avenue de l'Opéra close to the state office.

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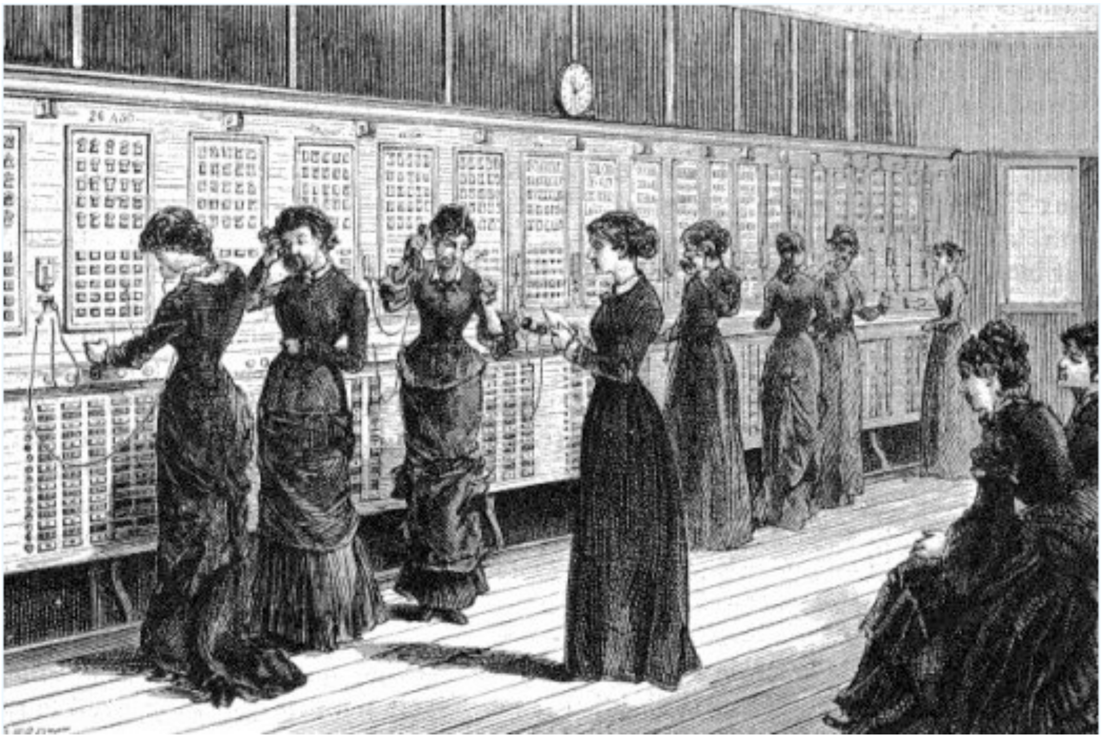
[215] Mareschal (1892: 57).

[216] *L’Album Industriel* (1894) also describes the théâtrophone network in “Le Théâtrophone,” vol. 1, pp. 122-4, Montreal, Canada.



[Fig. 34] Women at Paris Bureau Central Téléphonique, Avenue de l'Opéra, 1881.[217]

By linking the théâtrophone network with the public telephone network into one larger telecommunications network, Mareschal (1892) further suggests that now the Bureau Central du Théâtrophone could "establish communications with all network subscribers in France or in a foreign country." What Mareschal means here are the regular telephone subscribers, who could choose to additionally sign up for distant théâtrophone entertainment. When a subscriber received théâtrophone entertainment, according to Lefèvre, that person could not simultaneously contact another person by telephone, but could always notify the female operator at the Bureau Central du Théâtrophone. She, in turn, contacted the other female telephone operators at the Paris Bureau Central Téléphonique to establish the desired connection. Finally, a last théâtrophone transmission line was a local city line that linked the Bureau Central du Théâtrophone via the Bureau Central Téléphonique to the city's coin-operated automatic théâtrophones in public listening spaces such as cafés and hotels.

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[217] Editions GR Univers "Le téléphone vedette de l'exposition 1881," available at http://www.gr-univers.fr/univers/13.php (April 2012). Also Borvon (2009).

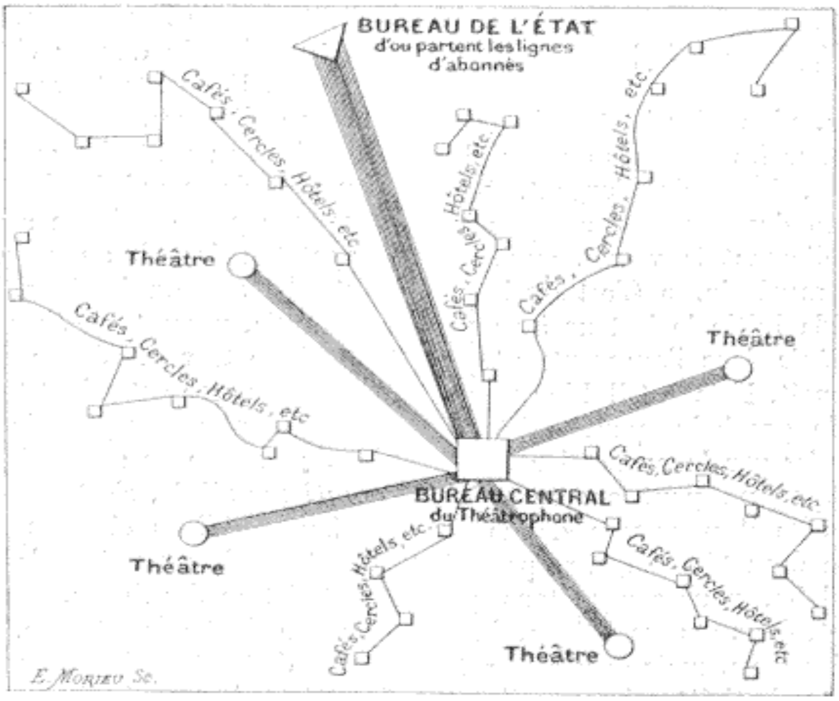
BUREAU DE L'ÉTAT
d'où partent les lignes
d'abonnés
Cafés, Cercles, Hôtels, etc
Théâtre
Cafés, Cercles, Hôtels, etc
Cafés, Cercles, Hôtels, etc.
Cafés, Cercles, Hôtels, etc
Théâtre
Cafés, Cercles, Hôtels, etc
BUREAU CENTRAL
du Théâtrophone
Théâtre
Cafés, Cercles, Hôtels, etc.
Cafés, Cercles, Hôtels, etc
Théâtre
E. Morieu Sc.

Fig. 2. — Diagramme de l'installation des lignes du théâtrophone

[Fig. 35] Paris théâtrophone network, 1892.[218]

One could say that the early théâtrophone network conceptually anticipated the star topology of modern computer networks. In their book *Computer Networks* (2009), V.S. Bagad and I.A. Dhotre explain that the "star topology consists of a number of devices connected by point-to-point links to a central hub" or a central switch. However, the individual devices themselves (like automatic théâtrophones) "are not directly connected to one another" (12).[219] Gary Shelly and Harry Rosenblatt in *Systems Analysis and Design* (2010) explain further that a computer network's "star configuration … provides a high degree of network control, because all traffic flows into and out of the switch. An inherent disadvantage of the star design is that the entire network is dependent on the switch" (474). Similarly, the central hub of the théâtrophone network—besides the Bureau Central du Théâtrophone itself—

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[218] Mareschal (1892: 56).

[219] More on the star topology provides Prakash C. Gupta's (2006) chapter "Local Area Networks" (322-40) in *Data Communications and Computer Networks*, Prentice-Hall of India, New Delhi.

represent the telephone switchboard and the “rosace des lignes.” Other devices of the network architecture include both the telephone transmitters or microphones to which the performers sing and, on the other side, the telephone receivers through which the audience listens. To put it another way, we might say that the Bureau Central du Théâtrophone was the server, while performers and listeners were the clients. This resembles in some measure a modern computer client/server architecture.

All théâtrophone listeners were dependent on the female operator. It was her task to organise all communications passing through the switchboard (shown in Figure 36 below). At her hands were the technological devices, electronic circuitry, indicators, displays, levers, and instruments to control the operations of the théâtrophone network. Without listeners noticing, she applied a galvanometer to measure at a distance the electrical resistance of subscription lines, and to check the status or working condition of the entire théâtrophone network from the Bureau Central du Théâtrophone. When two théâtrophone listeners wanted a telephone conversation during theatre intermission, they had to call the théâtrophone operator who in turn, as mentioned earlier, called another telephone operator at the Bureau Central Téléphonique to finally connect the two listeners through the public telephone network.[220]

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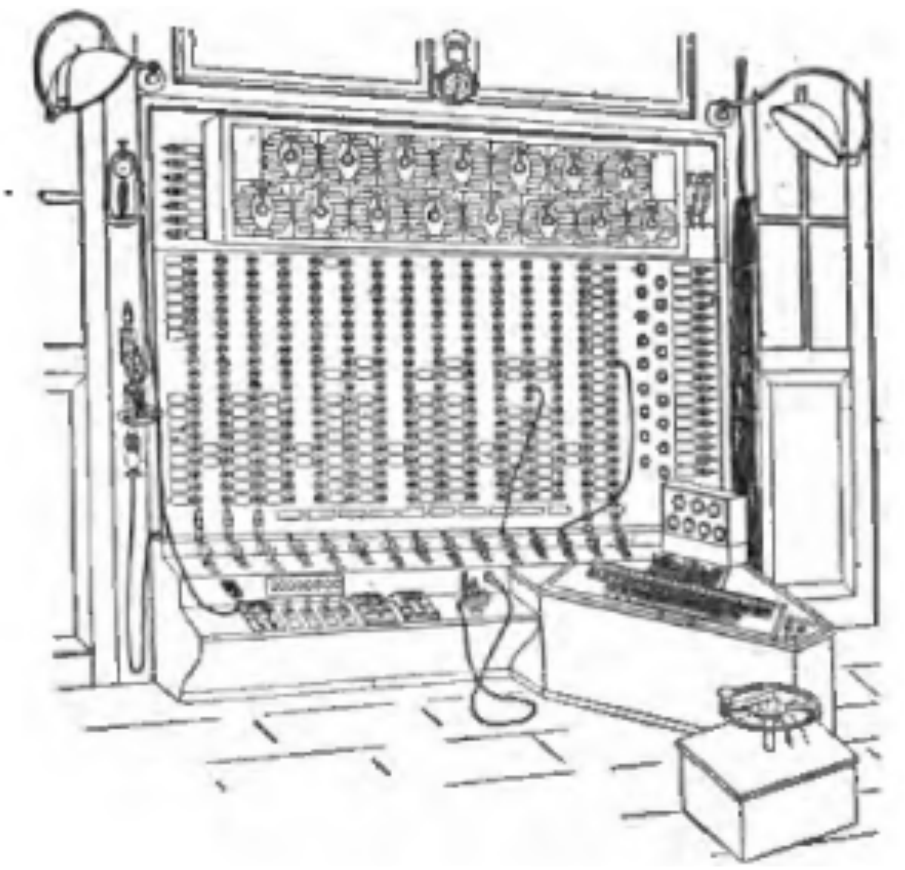
[220] See Lefèvre (1896: 387-93).



[Fig. 36] Switchboard of théâtrophone network, 1896.[221]

She also had the power to convert one transmission line into several independent listening channels—an important function since not all clients linked to one transmission line wanted to listen to the same sort of theatre entertainment. To do this, she had special indicators on the dashboard above her switchboard in the Bureau Central du Théâtrophone that always showed the current state of affairs with the listening channels. She could control, activate, or disconnect the channels so that different listeners could listen to different types of theatre entertainment simultaneously happening on Paris stages.[222] Thus, the female théâtrophone operator played a unique role in early telephone music because of her technological skills, and because all distant communications passed through what John Durham Peters in his book *Speaking into the Air: A History of the Idea of Communication* (1999) calls the discourse of “passive, neutral or feminine gender identity” (196). She received distant requests and sent back what was demanded from her.

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[221] Lefèvre (1896: 387).
[222] See Mareschal (1892: 58).

Should, for instance, a connection to the Ópera de París fail, the female théâtrophone operator could decide whether to switch channels to the Opéra Français or any other theatre. Such a network failure would affect all distant listeners of the Ópera de París. Should two network links fail, say, one automatic théâtrophone and one subscription théâtrophone, nobody would be affected except the listeners using those two automatic and subscription théâtrophones. Bagad and Dhotre (2009) explain that a network star topology—like that of the théâtrophone network—represents a "robust network," given that "if any link fails it does not affect the entire network" (12). But should for some reason or another the théâtrophone operator collapse in the basement, it would affect all distant listeners. Put differently, a problem of the network star topology in the world of computer networks is, "if the central hub fails, the whole network fails to operate" (12). Given that the théâtrophone network had no human fail-safe mechanism, nobody in the network could establish communications until a new female operator would take over operations in the underground control centre.

Unlike the listeners, performers would not notice if the théâtrophone network failed. Performers did not consume sound from the théâtrophone network, but supplied it through the barely noticeable telephone transmitters mounted on the floor of the theatre stage. Though lively theatre performers, they were, in a sense, only passive théâtrophone performers as they acted primarily for their direct audience in the auditorium, and less for the invisible listeners in the distance. Most likely these performers did not even notice when, say, a power shortage caused telephone transmitters on stage to fail, or the telephone switchboard to cease communications altogether. Théâtrophone networks thus divorced the performers from their audience as opposed to the performers among themselves. Unlike the théâtrophone audiences in their private and public listening spaces, the performers remained collectively in the same acoustic space. Only the scattered audiences as well as the "female body hidden at the heart of a national communications network" (Peters 1999: 196) became aware of when the théâtrophone network was interrupted.

4.3.3. Listening Lust

The lust for listening to telephone music grew in Europe over the late 19th century. Whereas Europe's cultural elites already expected a new generation of live entertainment, Europe's masses still physically attended live events. Franz Kafka in his novella "A Hunger Artist" (1922) portrays one such type of early live entertainment. With great enthusiasm, the masses witnessed at public events the so-called hunger artists, whose impresarios locked them up like joyless tigers in circus cages. The thinner and closer to death a hunger artist sounded, the better he performed for the sensation-hungry masses. In contrast to this macabre case of live entertainment, Europe's cultural elites were already paving the way for the future of telephone music.

Throughout the 1880s, the main impetus to European telephone music was Ader's successful demonstration of auditions téléphoniques at the Paris Exposition Internationale d'Électricité in 1881. Countless events of telephone music followed Ader's example. Heinrich Raatschen (2005: 149) in *The Technical and Cultural Invention of Television in the Years 1877—1882* notes about telephone music the following entrepreneurial response to Ader's demonstrations:

> The Musée Grévin, quickly responded with a spectacle palace that opened in January 1882 on Boulevard Montmartre with wax works and a stage. There, permanent auditions téléphoniques were established immediately after the popular success of the Electrical Exhibition. In a room—where between dance revues since 1886 the young Georges Méliès appeared as a magician, and in 1892 the first animated film of cinema history was shown—people could listen by telephone not to the cultured operas of the Electrical Exhibition, but to the shabby repertory ("repertoire grossier") of a Varieté from the Boulevard de Strasbourg. A visitor remarked that he is unsure of what is worse, the stupidity of the songs or the stale air in the basement provided for the auditions téléphoniques.[223]

Even though Raatschen seems to say that telephone music was intended for the cultural masses from the beginning in the early 1880s, it also involved the European elites. In 1882, composer Richard Wagner and his son Siegfried listened in Venice to auditions téléphoniques of Wagner's own opera "Die Meistersinger von Nürnberg."[224] In 1884-85, the King and Queen of Portugal set up Ader's auditions téléphoniques in

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[223] Author's translation from German. Title: "Die technische und kulturelle Erfindung des Fernsehens in den Jahren 1877-1882." Quote: "Schnell reagierte auch das Musée Grévin, der im Januar 1882 eröffnete Spektakelpalast am Boulevard Montmartre mit Wachsfigurenkabinett und Bühnensaal. Dort hat man unmittelbar nach dem Publikumserfolg der Elektrizitätsausstellung permanente auditions téléphoniques eingerichtet. Man hörte dort, wo zwischen Tanzrevuen ab 1886 der junge Georges Méliès als Zauberkünstler auftrat und 1892 der erste Trickfilm der Kinogeschichte gezeigt wurde, per Telefon nicht die kultivierten Opern der Elektrizitätsausstellung, sondern das schäbige Repertoire („repertoire grossier") eines Varieté vom Boulevard de Strasbourg. Ein Besucher bemerkt, er wisse kaum, was schlimmer sei, die Blödheit der Lieder oder die schlechte Luft in dem Kellerraum, den man für die auditions hergerichtet hatte."

[224] See Manfred Schneider's chapter (2005: 206) "La vitesse des sons. Proust und das Telefon" (193-213), in *Proust und die Medien*, eds. Uta Felten and Volker Roloff, Wilhelm Fink Verlag, München.

Lisbon for their private entertainment.[225] In Budapest, a decade before the engineer Tivar Puskas became a prominent figure with Telefon Hírmondó in the 1890s, he had organised several telephone concerts in the early 1880s.[226] In Munich in 1884, a theatre manager installed private telephone lines to "his villa" at Tutzing on Lake Starnberg "to monitor every performance" in his theatre (Marvin 1988: 210). In Berlin, the city's event and Science Centre called Urania Berlin transmitted telephone music.[227] In Brussels in 1885, Belgian engineer F. Van Rysselberghe installed auditions téléphoniques so that, as Marvin writes, the "Minister of Railways, Posts and Telegraphs and other high public officials [could] listen to live opera thirty miles away at Antwerp" (210) (Figure 37 below refers to Rysselberghe's 1885 public installation).[228] In Stockholm, the first telephone opera occurred in May 1887, and musical services were continued until 1925.[229] Whether in Frankfurt, Manchester, or Vienna, telephone music events took place throughout Europe in the 1880s.[230] What began experimentally with musical telegraphy in the 1870s increasingly became a comparatively sophisticated medium of telephone music in the 1880s.

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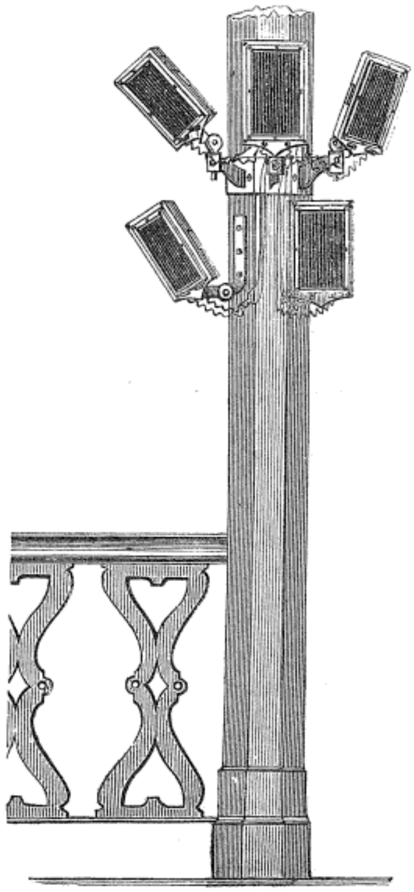
[225] Marvin (1988: 209-31) reports many other telephone music events throughout the 1880s.
[226] Weidenaar (1995: 2).
[227] Stopka (2005: 157). See also *Electrical World* (1884) "Music by Telephone in Germany," May 3, pp. 485-6.
[228] On Belgian auditions téléphoniques focuses Charles Mourlon (1885) "Auditions téléphoniques par le système F. Van Rysselberghe" (103-29), in *L'Électricité à l'Exposition Universelle d'Anvers*, Imprimerie du Mouvement Industriel, Bruxelles.
[229] Lange (2003) references the former Swedish Telemuseum.
[230] Lefèvre's (1896: 383).



Disposition des microphones de Van Rysselberghe au kiosque du Waux-Hall, à Bruxelles.

[Fig. 37] Rysselberghe's microphones in Brussels transmitted auditions téléphoniques to the Universal Exhibition in Antwerp, Belgium, 1885 (see a listener in Fig. 18 above).[231]

During the 1890s, telephone music went through another phase of cultural diffusion. It was the medium's systematic commercialisation and institutionalisation in different European cities. Following the Paris Compagnie du Théâtrophone as a trendsetter in 1889, in Budapest Telefon Hírmondó began in 1892, the London Electrophone Limited in 1895, and Rome's L'Araldo Telefonico in 1910. Both the companies and some of their founders operated internationally. For instance, engineer Tivar Puskás—who started Telefon Hírmondó together with his family in Budapest, Austria-Hungary in 1893 (Figure 38 below)—had worked previously in England, had joined Edison in America in 1875, and had installed his telephone exchange system in Boston in 1877 and in Paris in 1879, where he had also helped Ader to stage auditions téléphoniques in 1881. It was the entrepreneurs Marinovitch and Szarvady who first institutionalised telephone music with their Compagnie du Théâtrophone in 1889. Unlike the technology inventors, the entrepreneurs did not just experiment with the technology anymore. They had already built on the results from previous experiments in telephony, and were thus able to better exploit the technology commercially. Though telephone music companies did not reach extended audiences like radio, they served up to several thousand subscribers. In 1901, for instance, Telefon Hírmondó—according to journalist Thomas S. Denison's (1901) article "The Telephone Newspaper"—had "6200 subscribers."[232]

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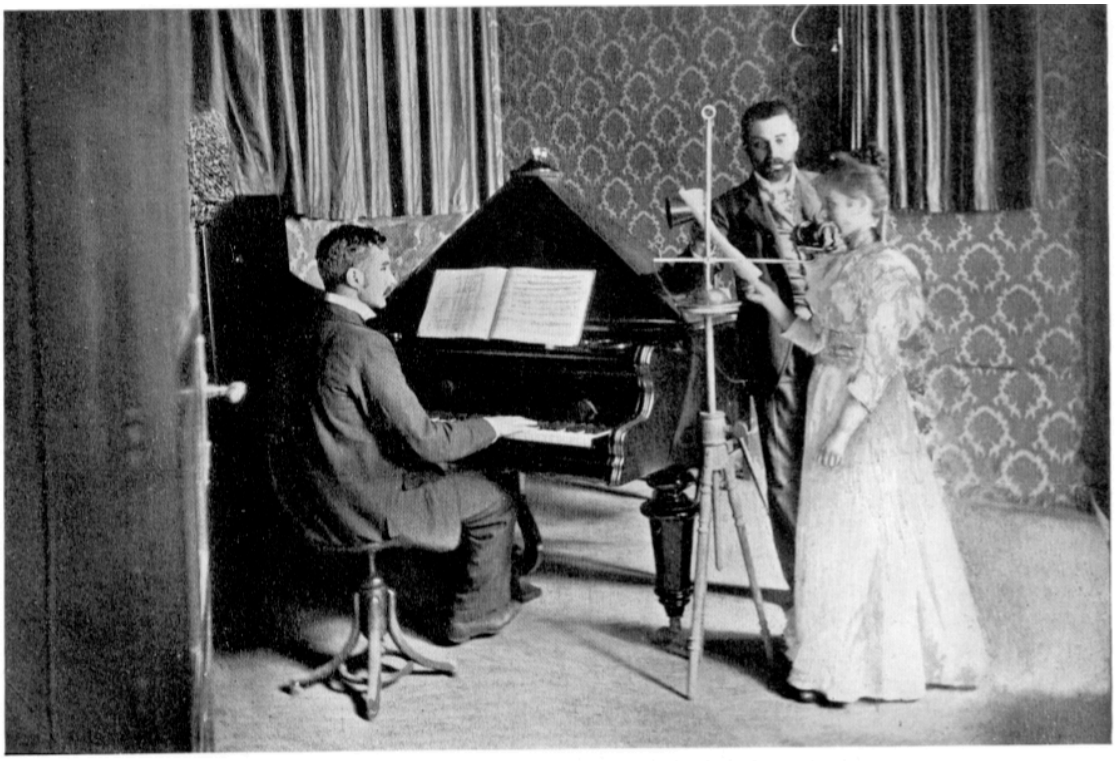
[231] Mourlon (1885: 120).



[Fig. 38] Tivar Puskás shows a singer and pianist at Telefon Hírmondó how to properly use the microphone in performing their music for live transmission to network subscribers in Budapest in 1901. Unlike the Compagnie du Théâtrophone in Paris transmitting from theatres and concert venues directly, in Budapest telephone music was transmitted centrally from Telefon Hírmondó.[233]

By reporting on the new sound medium, journalists also influenced or steered the diffusion of telephone music in the late-19th century. Several years before the London Electrophone Limited started its commercial services in 1895, journalists had already functioned, so to speak, as sound scouts, as if their intention was to psychologically gear up readers for the future of electroacoustic music. By reporting on the technology and events of telephone music in electrical magazines, they made readers interested and perhaps created interest in the new medium in the country and abroad. The following passage of *Electrical Review* (1891) reports on the "great success" of Paris' Compagnie du Théâtrophone:

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[232] Telefon Hírmondó's number of subscribers increased until the 1930s. On the company's organisation of daily entertainment programs in the 20th century, see Carolyn Marvin's (1988) "Telephone Diffusion: A Proto-Broadcasting system" (222-31). Jonathan Sterne (2003: 191-6) mostly references Marvin on Telefon Hírmondó.

[233] Denison (1901: 634).

> The theatrophone, the adaptation of the telephone by which private persons can have their opera turned on like gas and water, has been so great a success in Paris that an exhibition of it is to be given in London. M. Szarvady, the manager of the Compagnie du Theatrophone, has arranged for private demonstrations at the Savoy Hotel, where the instrument will be put in connection with the Savoy Theatre, and the "Nautch Girl" transmitted automatically (554).

Whereas the above text announced Szarvady's plans for telephone music, a later passage in the same magazine *Electrical Review* (1891: 578) confirmed that Szarvady had actually staged a private théâtrophone show in London, in August 1891. In the same year, (still before the launch of the Electrophone Limited), the Universal Telephone Company mounted 50 telephones in the Royal Italian Opera House in Covent Garden and another 50 telephones in the Theatre Royal, Drury Lane. According to Marvin (1988: 209-16), Sir Augustus Harris received these theatre performances by telephone at St. John's Wood. His telephone entertainment was preceded by another spectacle two years earlier in 1889. London theatre-goers had the option of attending *The Yeoman of the Guard* by telephone; this production was staged several nights a week at the Savoy Opera. These telephone events occurred locally within city boundaries. By contrast, during the London Electrical Exhibition in 1892, live musical performances were transmitted long distance city-to-city from South London's Crystal Palace in Penge Common, 60 kilometres north to Liverpool and 340 kilometres further to Manchester.

With the establishment of the London Electrophone Limited in 1895, irregularly occurring telephone performances became regular: "By 1896, the affluent could secure private connections to a variety of London entertainments for an inclusive annual rent of ten pounds sterling in addition to an installation fee of five pounds" (Marvin 1988: 210). Besides other clients, the most famous was the British Queen, who "enjoyed direct connections to her favourite entertainments" from the Electrophone Limited (id.). As in public spaces of Paris, in "public places of London, it was said, not just the affluent but anyone might listen to five minutes of theatre or music for the equivalent of five or ten cents." (id.) This was done by an adaptation of

France's automatic théâtrophones called automatic electrophones (see Figure 33 further below). "One of these [vending machines was in] the Earl's Court Exhibition, where for a few pence 'scraps of play, music-hall ditty, or opera could be heard fairly well by the curious'" (id.). In addition to music, British churches also—as already practiced in the United States—transmitted their holy masses regularly by telephone. Christ Church in Birmingham provided such services to telephone worshippers in London by Electrophone; and the Electrophone Limited also linked the cities of Derby, Coventry, Kidderminster, Hanley, and Manchester with the churches of St. Margaret's, Westminster, St. Anne's, Soho, St. Michael's at Chester Square, and St. Martin's-in-the-Fields at Trafalgar Square.

The new sound-transmission medium conveyed voices from city to city and city to coast. Hospitalier (1884), writing in *La Nature* reported that on September 5, 1884, the Belgian King and Queen listened by telephone from Châlet Royal in Ostend on the English Channel to the first and final acts of Goethe's *Faust* performed 100 kilometres away in Brussels at Théâtre Royal de la Monnaie (see Figure 39 below). Both King and Queen listened "without anything disturbing in the telegraph service."[234] Two days later on September 7, 1884, the King and Queen also enjoyed the entire five acts of the French opera *Les Huguenots* by telephone, featuring music by dead composer Giacomo Meyerbeer. John Durham Peters writes in *Speaking into the Air* (1999) that the medium of writing—like Meyerbeer's written musical opera notation—made "possible remote control over other bodies and voices;" writing such as Goethe's play script *Faust* enabled a cultural memory; the "preservation" of "thoughts … made possible a new order of polygamous coupling among souls" already before telephony. "The far could now speak to the near, and the dead could now speak to the living" (138). Ironically, while listening to *Faust* by electric telephony, the Belgian King and Queen were actually remotely controlled by the "Faustian impulse to embrace the whole world in the nerve net of electricity" (Marvin 1988: 217).

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[234] Author's translation from French: "et cela sans déranger en quoi que ce soit le service télégraphique." Édouard Hospitalier (1884) of *La Nature* cited in Lange (2003). See also Mourlon (1885) on "Expériences du Châlet Royal d'Ostende et du Palais de Laeken" (122-6).

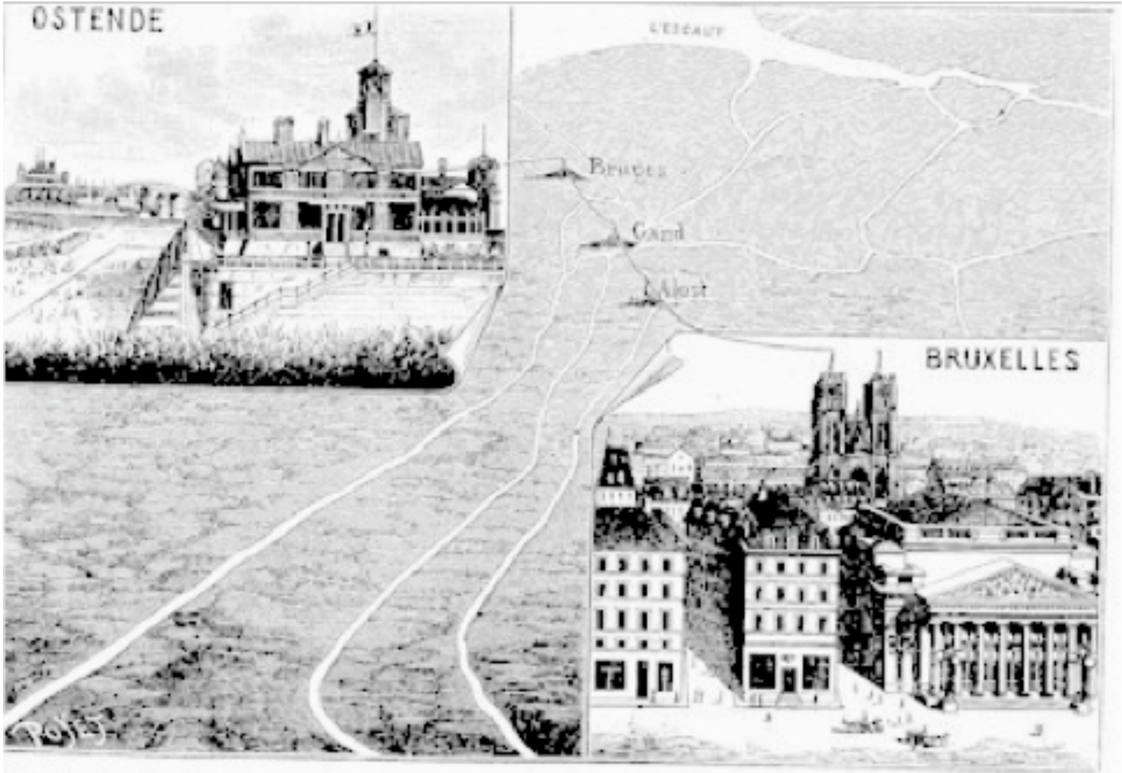

Fig. 65. — Pavillon balnéaire du roi et de la reine des Belges, à Ostende, relié par le téléphone au théâtre royal de la Monnaie, à Bruxelles.

[Fig. 39] Long-distance music transmission from Brussels-to-Ostend, Belgium, 1884.[235]

Considering long-distance music transmissions, it seems no coincidence that writers draw analogies between the nerve nets of public supply networks and the private supply of music by telephone networks. Already in 1891, the earlier-mentioned writer of *Electrical Review* drew such a network analogy to portray the image of an ever-present telephone supply of opera music in Paris. With the théâtrophone, to recall the analogy, "private persons can have their opera turned on like gas and water." Thirty-seven years later in 1928, public supply networks had advanced and electrical power become ubiquitously available to the masses at home.[236] In the context of a general electrification and the new medium of radio, French lyricist and philosopher Paul Valéry draws a similar network analogy on the circulation of art and music in his influential essay "La Conquête de l'Ubiquité" (1928) or "The Conquest of Ubiquity." He writes, "to hear music in any point of the globe in the very moment of its performance" and "to reproduce a musical composition at one's pleasure in any point of the globe at any time" had represented two major technological problems resolved now. As its "solutions become more perfect every day," Valéry proposes that:

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[235] André Lange (2003) "La diffusion Internationale," in *Le premier medium électrique de diffusion culturelle: Le théâtrophone de Clément Ader (1881)*, available at http://histv2.free.fr/theatrophone/theatrophone2.htm (April 2012).

[236] See Thomas P. Hughes (1983) *Networks of Power: Electrification in Western society, 1880-1930*, Johns Hopkins University Press, Baltimore and London.

> Works of art will acquire a kind of ubiquity … Just as water, gas and electricity flow into our homes from afar almost imperceptibly, to serve us, so will we be provided with images or sound sequences, which, with a small jolt, as if by magic will disappear and leave us as before. Just as we are accustomed, if not enslaved, to the various forms of energy that pour into our homes, we shall find it perfectly natural to receive the ultrarapid variations or oscillations that our sense organs gather in and integrate to form all we know. I do not know whether a philosopher has ever dreamed of a company engaged in the home delivery of sensory reality. Of all the arts, music is nearest to this transposition into the modern mode. Its very nature and the place it occupies in our world mark it as the first to be transformed in its methods of transmission, reproduction, and even production. Of all the arts it is the most in demand, the most involved in social existence, the closest to life; whose organic functioning it animates, accompanies, or imitates.[237]

In this passage, Valéry envisions a future of musical companies for the "home delivery of sensory reality." His wonderful analogy that music flows like "water, gas and electricity" into our homes anticipated the ubiquity of music on the Internet today. "The Conquest of Ubiquity" (1928) also captured the attention of Walter Benjamin quoting Valéry in "The Work of Art in the Age of Technological Reproduction" (1936). "But Valéry, unlike Benjamin," as cultural critic Diedrich Diederichsen (2009) explains, "was not very interested in a theory of reproduction or of the technology and the apparatus of media since, for him, the technical prerequisites were secondary to the magic of dissemination." However, despite Valéry's poetical or lyrical interest in music transmission, its "magic of dissemination" was already an old media phenomenon of telephony. It was only revived by the new medium of radio when Valéry wrote "The Conquest of Ubiquity" in 1928 at the age of 47. At the age of ten in 1881, Valéry lived in the southern French port town of Sète, and radio music did not exist. That is when Ader staged telephone music for the first time at the Paris International Exhibition of Electricity. When Valéry began his "scientific readings" years later in 1893, and he moved to Paris in 1894 to become "deeply involved in the literary and artistic life," a company for the "home delivery of sensory reality" was not a philosopher's pipe dream anymore.[238] The Compagnie du Théâtrophone had transformed this dream into reality, bringing electroacoustic music to Paris homes just like "gas and water."

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[237] Author's translation from French and German: "Faire entendre en tout point du globe, dans l'instant même, une œuvre musicale exécutée n'importe où. En tout point du globe, et à tout moment, restituer à volonté une œuvre musicale. Ces problèmes sont résolus. Les solutions se font chaque jour plus parfaites." German: Benjamin (1936 [1977]: 11) cites only Valéry's first phrase. Full quote: Valéry (2003) "La conquête de l'ubiquité," in *Classiques des sciences sociales*, ed. Jean-Marie Tremblay, Université du Québec à Chicoutimi, Chicoutimi, QC, Canada. An English version of Valéry's essay offers Jackson Mathews (1964) "The Conquest of Ubiquity" (225-6) in *The Collected Works of Paul Valéry*, trans. Ralph Manheim. Pantheon Books, New York.

As Valéry refers to the magical dissemination of radio and phonograph music, all the more magical was the dissemination of telephone music internationally. Musical companies could disseminate music locally, and they could disseminate long distance, depending on the telephone networks. In his book *Radio Art* (1991), Robert Hawes comments on the international dissemination of telephone music: "As well as receiving 'local' relays from theatres, churches and London's Royal Opera House, … [the Electrophone] could also switch to exchange programmes from Europe via a link-up with the French [Théâtrophone] company" (24). To reassure Hawes, already three years before the launch of Electrophone Limited in 1895, *L'Électricien* (1892) reported on a new telephone circuitry operating between Paris and London as a new opportunity for international théâtrophone transmissions. One such transmission involved the opera *Salammbô* (already adapted from Gustave Flaubert's novel *Salammbô*) by French composer Ernest Reyer who staged his work at the Ópera de París, and transmitted live to Burlington House on Piccadilly, London. Though the sounds "had not been transmitted in its integrity," as *L'Électricien* continues, "several passages were still perfectly rendered, despite the distance" of about 500 kilometres (46).[239]

Mareschal (1892) also mentions that théâtrophone transmissions were "not only for the cities of France but also in London one can listen to the Ópera de París" (56). Note that Mareschal writes the plural French "cities." On that score, Julien Lefèvre (1896: 395) makes clear that the Compagnie du Théâtrophone operated in Paris and also in Bordeaux, where its main office was located on the Rue de la Devise. From there, it transmitted music to subscription théâtrophones in private homes and to distant listening rooms in Rue Sainte-Catherine. Another listening room served only special théâtrophone events aiming to raise public demand for the service. Lefèvre and Hawes also mention a further international théâtrophone transmission, that is, between Paris and Brussels, operating since 1887. Paris-London transmissions opened four years later in 1891. Cultural historian André

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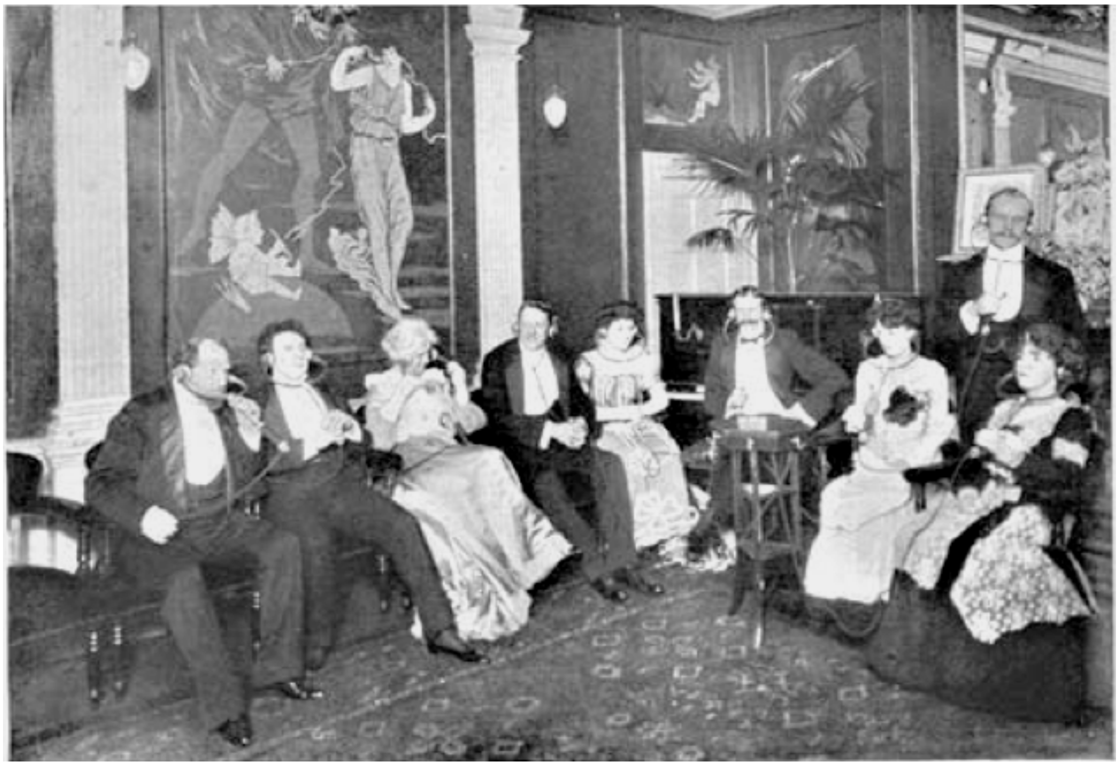
[238] Brian Stimpson and Niels Buch-Jepsen (2010) "Chronology of Valéry's Life and Works," in *Valéry Studies*, University of Newcastle upon Tyne, available at www.paulvalery.org (April 2012).
[239] Author's translation from French.

Lange (2003) calls this network expansion phase in the development of telephone music "la diffusion internationale."



[Fig. 40] Electrophone Salon on Gerrard Street, London between 1901 and 1903.[240]

However, in the 1890s telephone networks were not installed internationally as far and wide as telegraph networks. Thus the transmission of telephone music occurred, besides on a few occasions, mainly within national and city boundaries. Yet it is remarkable how telephone music resembles the familiar dissemination of music on the Internet; that is, telephone networks about a century later in the 1990s onwards.[241] One could say that what became modern as network music in the 20th century had already 'arrived,' so to speak, in the late 19th century.

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[240] Henry Thompson (1903: 115) "Telephone London" (115-23) in *Living London: Its Work and its Play, its Humour and and its Pathos, its Sights and its Scenes, 1901-1903*, ed. George Robert Sims, Cassell, London.

[241] See Paul Collins (2008) "Theatrophone: the 19th-century iPod," in *The New Scientist*, vol. 197, iss. 2638, pp. 44-5.

Discussion

This chapter has explored the first transformation in the history of music from acoustic to electroacoustic music by telephone. It has engaged in the debate on early telephone music and specifically challenged one dominant position held both by Carolyn Marvin (1988) and Jonathan Sterne (2003), who argue that telephone music was only a preliminary test or “experimental” development in the history of music transmission.

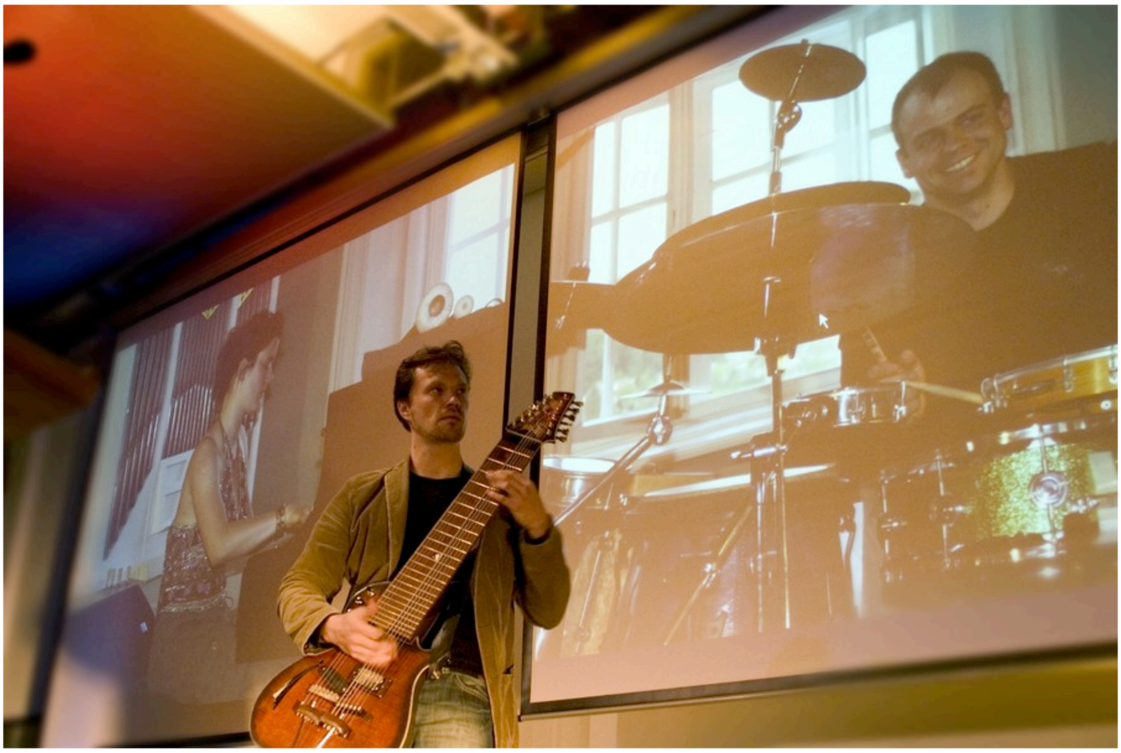
My point in Marvin and Sterne’s debate is that telephone music remained not just an experimental media development. It had its own time or era in the history of music transmission, which substantially preceded radio broadcasting by about two human generations; that is, between the 1870s and 1930s, and commercially between the 1890s and 1930s. Instead of lumping these two human generations in the development of the medium into the same historical classification of experimental media systems, I have divided the early development of the medium into three microphases. Each contains its own nuances: Between 1870 and 1900—that is, the medium’s technocultural origins in musical telegraphy; its transformation into actual telephone music; and its wider commercial exploitation as institutionalised telephone entertainment throughout Europe. Building on predecessors of the transmission technology throughout the 19th century, Elisha Gray introduced musical telegraphy in the United States in the 1870s. Next, in France Clément Ader pioneered telephone music in the 1880s. Bélisaire Marinovitch and Geza Szarvady commercialised it in the 1890s. Put differently, their launch of the Paris Compagnie du Théâtrophone completed the purely experimental phase of the medium. Market forces took over and pushed the medium onto a new European stage. These three phases in the development of the medium—its cultivation, differentiation, and diffusion—are so valuable because they explain how telephone music outgrew its first experimental nature.

There is still some ambiguity in the term “experimental.” In his book *Silence* (1995), John Cage refers to this ambiguity, saying that he used to “object” when people would classify or label his music as “experimental” (6). Cage explains, “composers knew what they were doing, and that the experiments that had been made had taken place prior to the finished works, just as sketches are made before paintings and rehearsals precede performances.” However, “there is an essential difference between making a piece of music and hearing one.” Cage continues, saying a “composer knows his work,” whereas a “listener is confronted” (7) with a composer’s work. From the perspective of the listener, Cage reasons that “the word ‘experimental’ is apt, providing it is understood not as descriptive of an act to be later judged in terms of success and failure, but simply as an act the outcome of which is unknown” (13). My point in Cage’s take on “experimental” is that Marvin and Sterne give less specific meaning to the term “experimental” beyond its common judgmental implications in a sense of that radio music “succeeded” in audience qualities and quantities, whereas telephone music “failed.” Cage’s idea is worth mentioning, for it more finely differentiates for whom and for what reasons something appears experimental. Future research on the marginalised issue of telephone music could reflect on this ambiguity in “experimental” and examine, for instance, for whom telephone music supposedly remained experimental—the inventors or the listeners.

The question as to whether telephone music remained experimental remains difficult to answer. In his book *Conceptual Blockbusting* (1974), Stanford University engineer James Adams might say that this question hints at the larger problem of intellectual “stereotyping” (15-21). It happens when scholars categorise, conceptualise, or classify certain objects, individuals, or phenomena by specific labels such as “Stanford,” “engineer” or “experimental.” We should not underestimate the power of stereotyping; once a stereotype starts to circulate, it also starts to settle into the conscious and subconscious human mind, even though we may accept or reject it as a preconceived construct. A seemingly insignificant label such as ‘experimental’ can in this way easily result in the obstacle of a “perceptual blockade.” In music listening, for example, “if your first introduction to organ music is at a funeral, it may be difficult later to think of using organ music in a joyful pageant. Organ music has been, in a sense, stereotyped” (20). Similarly, if someone’s introduction to the field of early telephone music came from an academic authority who deemed it experimental, it may be difficult later to think of telephone music as a non-experimental medium. Telephone music has, in a sense, been stereotyped. Therefore, if we understand the history of music transmission merely as a history of mass media, then some other, notable music media could be overlooked or obscured by clouds, just as the leaves of a large plant can shade out a smaller plant, or larger social masses can overshadow smaller social classes and their underlying forms of musical life.

Before moving on to the next chapter, I would like to place the subject of telephone music in the context of four historically later-occurring shifts in media of sound transmission. First, telephone music emerged from musical telegraphy and was in use for about half of a century between the 1880s and 1930s. Second, radio as a one-way broadcasting medium originally emerged from wireless telegraphy. Radio started to supersede telephone music in the 1920s, later accompanied by television broadcasting. Third, only 1960s and 1970s technological developments in computer and satellite communications revived for music the primary purpose of telephony as a two-way means of communication; they, eventually, paved the way for most interactive digital media today. Out of all these media technologies, only radio and television lack real-time communication and interaction among distant human beings. Chapter 3 “Ensoniment and Distance Music” investigated the theoretical implications for the media that this shortcoming implies. Chapter 4 provided a case study on telephone music in the late 19th century. By contrast, the next chapter presents a case study on the digital sphere and transformations in music-making on the Internet today and tomorrow.

5. Case Study: Jamming at the Speed of Light on the Internet?



[Fig. 41] "On the way to the virtual rehearsal room." Three-way telematic concert by inventor Alexander Carôt on bass in Lübeck, Germany, and a distant drummer and pianist in Berlin and Paris on December 15, 2006.[242]

Telematic systems will affect human consciousness and transform our culture.

Roy Ascott in "Art and Telematics—Towards a Network-Consciousness" (1984: 52)

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[242] Author's translation from German: "Auf dem Weg zum virtuellen Proberaum." University of Lübeck (2012) "Forschungsprojekt zur verzögerungsfreien Übertragung im Internet," available at http://www.uni-luebeck.de/aktuelles/nachricht/artikel/forschungsprojekt-zur-verzoegerungsfreien-uebertragung-im-internet.html (April 2012).

Introduction

The last chapter provided a historical background on distance music. This chapter explores the contemporary situation of distance music based on interview material with influential manufacturers of digital music technologies and professional musicians.[243] Although the interviewees will show how radically digital technologies have transformed musical practices, it will become clear that the problem of geographical distance among remote performers especially remains a surprisingly untouched issue—at least for most musicians. It is surprising because network jam sessions, as mentioned earlier, are the modern-day equivalents of early telephony, with operators playing online among distant switchboard stations in the 1880s. Today, over a century later, several manufacturers of digital music technologies are still reluctant to develop technology for remote musical performance. Why? The interviewees address this issue in the development of technology for distance music, and provide a wealth of insights about the recent digital transformations in music and technology. As a result, this chapter will show that, even within highly technologised societies, there is a digital divide in music making. It exists between a minority of privileged musicians with access to specific technologies, and the majority of musicians without access.

The idea of interviewing leading manufacturers of music technology reaches back to one specific observation on November 11, 2007: a distributed musical rehearsal by the SoundWIRE group at Stanford University's Center for Computer Research in Music and Acoustics (CCRMA).[244] That day, SoundWIRE was rehearsing for an upcoming three-way telematic concert held simultaneously in three locations across the United States. In addition to SoundWire's players, the twenty distributed concert musicians included nine players for Pauline Oliveros' Tintinnabulate Ensemble at Rensselaer Polytechnic Institute in Troy, New York, and ten players for Mark Dresser's VistaMuse Ensemble at the University of California (UC), San Diego. At CCRMA, composer and researcher Chris Chafe conducted the SoundWIRE group. He also played his self-built electronic Celleto. The technical director at the computer and mixing console in the centre of the rehearsing room was student Juan-Pablo Cáceres. He monitored the software JackTrip for “high-quality audio network performance over the Internet,” and played a Nord Lead synthesiser.[245] While other students played traditional acoustic musical instruments such as the guitar, violin and flute, others played virtual instruments on their laptops, as one student does below in Figure 42, using a laptop. A video projector audiovisually brought the distant performers into the rehearsal room. Closing one’s eyes, it was hard to believe that their echoing voices interacted from far away.

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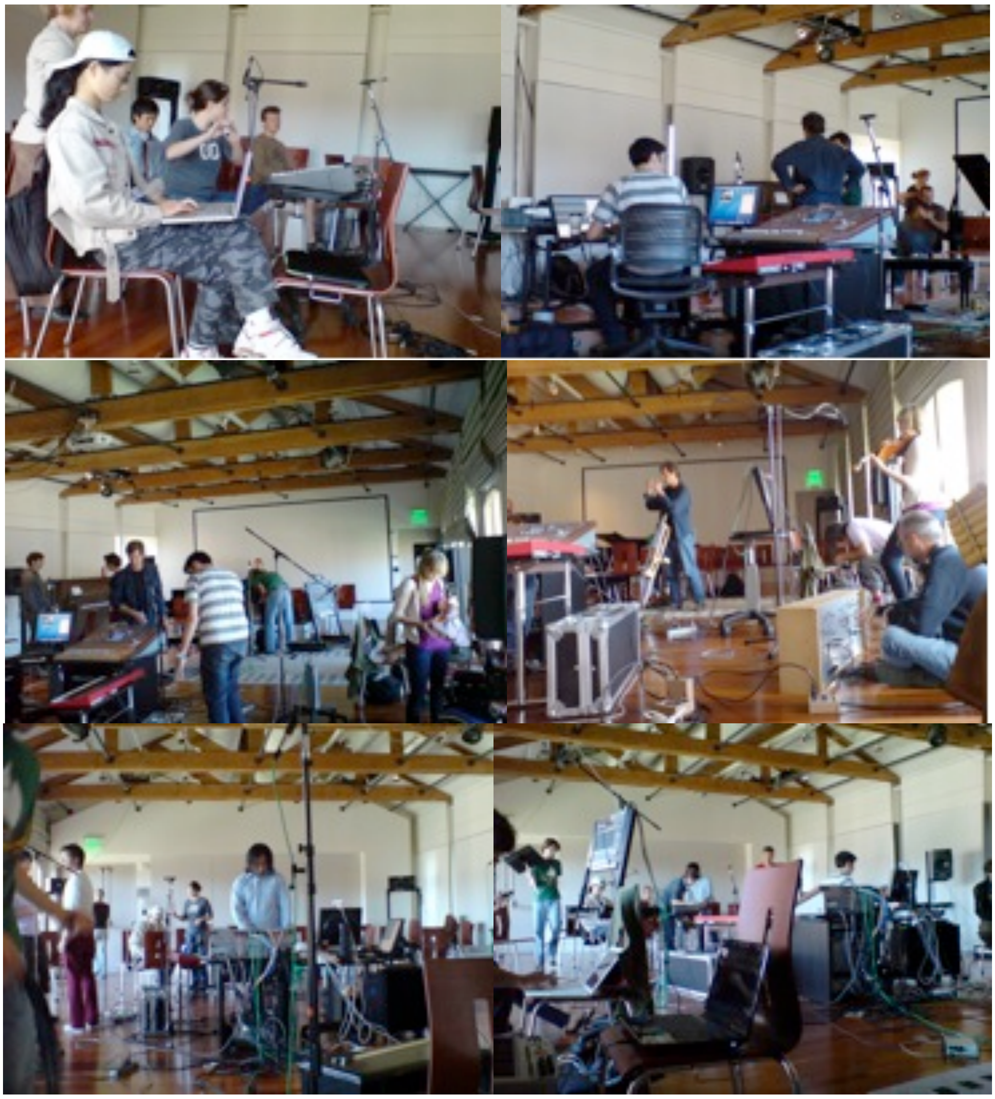
[243] The chapter title questions Mike Kobrin's (2007) original title "Jamming at the Speed of Light," in *Wired Magazine*, available at http://www.wired.com/print/software/coolapps/news/2007/01/72612 (April 2012).

[244] SoundWIRE means Sound Waves on the Internet from Real-time Echoes.



[Fig. 42] Telepresent rehearsal of the SoundWIRE group, Stanford University, 2007.[246]

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[245] Juan-Pablo Cáceres (2010) CCRMA “Software,” available at https://ccrma.stanford.edu/groups/soundwire/software/ (April 2012).

[246] Author’s photos.

How does the observation of SoundWIRE's distributed rehearsal concern manufacturers of digital music technology? Two main objectives are in play here. First, in the world of music and media one often hears said that digital technologies have transformed musicians' practices; but how and where do these transformations take place? One objective of this chapter is to bring to mind some key insights into these changes from the voices of the manufacturers of music technology themselves, articulating how virtual music studios and virtual instruments transform music-making. It is important to value the insights of the manufacturers beyond the frequently heard and seen music technology advertising in technical magazines, the Internet, and other media. Second, following this discussion on digital transformations in music-making is to find out to what extent the surveyed manufacturers develop technologies for interactive music-making on the Internet. We will find that most of them are less involved in the development of telepresent technologies to play music at a distance, even though interaction among musicians plays such a vital role in live music. What are the reasons for the manufacturers' hesitant attitude towards distance music? Put differently, an objective of this interview-based media study is to give the interviewees a voice, to let them say why they do not engage in distance music. In between interview passages and in the chapter section "Glitches of Distance Music" I will elaborate on some main points mentioned by the interviewees and shed light on some specifics as to why the vast majority of amateur and professional musicians cannot creatively meet at a distance in the manner of SoundWIRE.

This study draws on interview data from two main groups of manufacturers of digital music technologies. A first group of interviewees is drawn from major music technology manufacturers, all known for their virtual music studios and digital audio workstations (DAWs). Similarly, the second group of interviewees is from professional musicians and companies that create virtual musical instruments. All interview data in this chapter (and in the thesis appendix A2) have been anonymised and blacked out (except when stated otherwise such as in the research literature quotes). All identifying information has been taken out including full names and employment details of the interviewees and commercial information such as company and product names in the case that unexpected research ethical issues arise.[247] Despite this, the edited text result of these interviewes resulted in an accurate and readable account of 12 interviews with musicians and manufacturers of music technology, providing ideas on digital music-making and insights into business operations.

Except for unaccompanied vocal music, music-making involves technology.[248] I chose to consult manufacturers of digital music technologies because their virtual music studios and instruments are prevalent tools used to produce and perform music. For example, a quick search for the manufacturer name "Ableton" reveals over 20 million entries online.[249] Many popular music institutes such as the School of Audio Engineering (SAE—a world-wide network of technical training institutes) and the Berklee College of Music in Boston, Massachusetts teach their students how to use, among other software, Ableton, Reason, Sonar, Cubase, and Pro Tools.[250] Interviewing the makers of music technologies provides firsthand insights into the contemporary world of music-making and musicians' practices. Note that there are already services such as Digital Musician, eJamming or Ninjam that attract users to make music online. I did not consult the providers of these services directly because they probably would not have given me an objective view of their products. That is why I decided to consult a wide range of experts in the field, including some of the veterans in the development of digital music technology. In short, I interviewed a representative cross-section of leading manufacturers of virtual music studios and instruments widely used by professional and amateur musicians today.

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[247] Methods researchers Alexander Bogner and Beate Littig (2009) provide a theoretical discussion on qualitative expert interviews in *Interviewing Experts*, Palgrave Macmillan, Houndmills and New York. Uwe Flick offers an overview of qualitative interview methods in (2005) *Qualitative Sozialforschung: Eine Einführung*, Rowohlt, Reinbeck. Also Friedrichs (1990). A practical discussion on the execution, transcription and analysis of qualitative interview data provides sociologist Jan Kruse (2008) *Einführung in die qualitative Interviewforschung*, Albert-Ludwigs-Universität Freiburg.

[248] See Evan Eisenberg (2005) *The Recording Angel: Music, Records and Culture from Aristotle to Zappa*, Yale University Press, New Haven and London. Also, Hans-Joachim Braun (2002) *Music and Technology in the Twentieth Century*, Johns Hopkins University Press, Baltimore, Maryland.

[249] Reviewed on Google, 17 August 2011, keyword "Ableton," results: 20.200.000.

[250] Berklee Music, available at http://www.berkleemusic.com/. SAE Institute at http://www.sae.edu (April 2012).

5.1. Virtualisation of the Musical

> All these computers, onstage, everything is computerised. Even the guitar players use laptops. They use [virtual amplifiers], which is a wonderful thing. For example, when we toured Brazil, instead of having Marshall cabinets around or whatever, we jumped on the plane with the guitar in one hand, and the laptop in the other. When we got to the venue, there was a big amplifier, and somebody brought that to my guitar player and asked, "Will this do?" And my guitar player replied, "Yeah, it will make a great stand for my laptop." And this guy was like, "What?" Then my guitar player puts his laptop on top of the amp stack, plugs the guitar into the laptop and starts playing. So, that is the only reason we use guitar amps. They make great laptop stands, also visually. We actually point the laptop to the audience so they can see the laptop running the guitar simulator. It sounds great, and it feels wonderful. We love it. ... Ironically, I am the only guy on stage without a laptop because I am the singer. One of the reasons we do all that is because many people think that computer music means only Kraftwerk. [*Interviewer:* But it is you guys and music technology.] And that is what it should be. It is human beings and technology together.
>
> (Interviewee, professional musician)

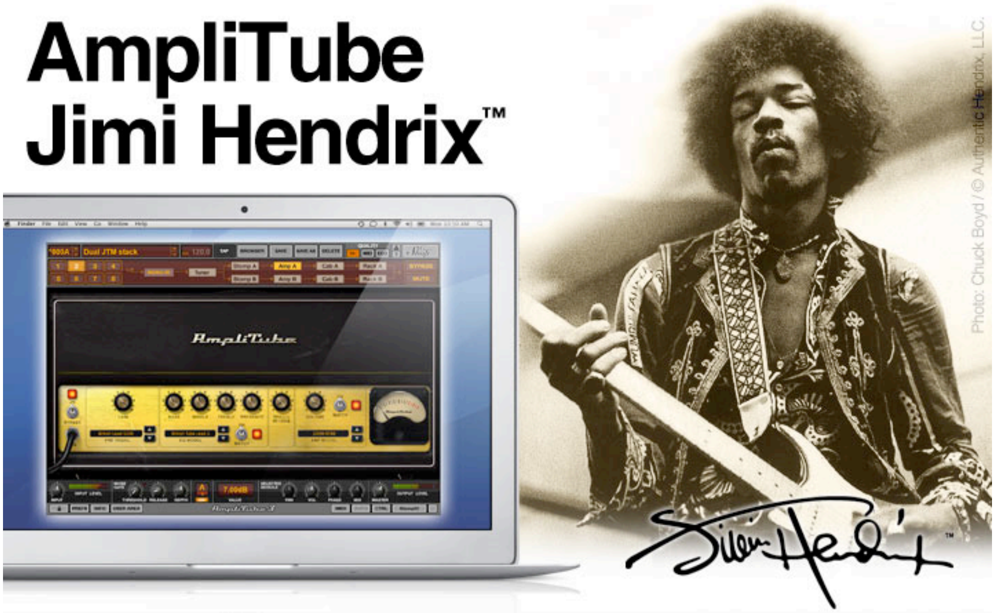
In his book *Electric Sound: The Past and Promise of Electronic Music* (1997), composer and electronic music scholar Joel Chadabe reflects that musical instruments always "reflect the times and places of their inventions." Whereas the violin is a technological invention of European preindustrial times, similarly the piano is a technological invention of industrial times. Both inventions entered many homes in Europe and around the world. Also today, it will become apparent through the interviews that the latest music technological inventions reflect our rapidly changing digital times. Today's musicians face a change from the traditional, tangible hardware instruments to intangible, virtual musical instruments. Such virtual musical instruments reach not only middle- to upper-class houses—as was the case with pianos and violins—but their digital nature allows these new instruments to be within reach of almost any home with a computer and Internet access. Accordingly, manufacturers of virtual musical instruments seek a spectrum of customers as wide as possible. This is reflected in accessible and user-friendly designs of technological interfaces for all skill levels, including non-musicians.

Having managed to interview some of the "heavy hitters" is worth mentioning, since these manufacturers play a key role in the evolving technological matrix of music-making today. They provide firsthand insight into this technological matrix. All of them mentioned a similarly profound mediamorphosis in the world of music making, reinforced through the commercialisation of personal computers, digital technology and the Internet in the 1990s. Computers and software as immediate recording, processing, and performance tools have radically lowered entrance barriers: "You do not need big studio equipment anymore," a Berlin-based manufacturer of virtual musical instruments notes, "you do not need to make big investments." Many of the previously expensive production tools for musicians have been miniaturised into virtual tools.

Morphing from hardware to a software-based life is the most profound transformation in music and technology. But what does this virtualisation of the musical actually mean? A manufacturer from Stockholm understands it as a "revolution in music" because it makes the traditional recording studio progressively obsolete, and altogether transforms traditional workflows and the work efficiency of recording, composition, and performance. "We took all of the music studio," a Hamburg-based manufacturer explains, "the hardware, [...] big mixing desks, and big tape machines [...], we put it all on the computer. [...] I work in the studio but my entire studio is inside my laptop now."

With musicians being able to produce music in their bedrooms and on tour buses, they seem to do so increasingly with virtual emulations of traditional musical instruments and equipment. On any laptop screen, they can see, edit, and move around song structures in the form of building blocks and virtual architectures as if they were words in Microsoft Word. Virtual music studios have made the traditional workspace for musicians at a fixed location progressively disappear in favour of mobile studios on laptops, and lately mobile telephones. We can observe an increased mobilisation and virtualisation of the musical world through which the entire process of music-making has been transformed.

Manufacturers' ideas behind the making of virtual musical instruments are to produce virtual equipment that sounds as good as hardware equipment—cost effective and mass produced. For one manufacturer from Italy, the goal was to "track down and find classic collectible gear that the average musician could never afford." They virtually "modelled" this classic gear at a fraction of the original cost to produce "software and release it at a price that almost everyone could afford." One of the company's virtual musical instruments models "over $36,000 worth of famous ... collectible guitar and bass gear." Similarly, another product models "over $30,000 worth of rare, almost impossible-to-find vintage guitar effects." In other words, the virtualisation of the musical involves a supply adjustment of formerly inaccessible production tools reserved for the well-funded creative élite, now accessible to the creative common. It is a redistribution of the production tools and facilities from the hands of a few into the hands of many.



[Fig. 43] Virtual music Technology "Plug into the Experience." [251]

In *Any Sound You Can Imagine: Making Music/Consuming Technology* (1997), Paul Théberge claims that our new digital and virtual music technologies "are not simply a response to the needs of musicians." But they became "a driving force with which musicians must contend." I agree that manufacturers have power as producers of music technology—a downside discussed further below. A point that needs emphasising is that although the interviewed manufacturers of music technology focus mostly on traditional musicianship, they also have found a new target group of practitioners, that is, non-musicians as creative consumers of music technologies. In recent years, with the rise of digital technologies and the Internet, manufacturers have tried to supply their products to a wide range of consumers, aiming for people of diverse musical skills. One manufacturer of a DAW states their strategy of supply: "With computers getting more affordable, and the software products getting more and more intuitive and easier to use—that has opened up a whole lot of possibilities for users at every level to get into the music-creation process on computers." With virtual interfaces designed for easy use, manufacturers have a way to reach out to the musical creativity of those people without any prior musical training—a musical creativity that takes shape in a different way through these new digital interfaces, as opposed to previous equipment. In this way, the virtualisation of the musical has revolutionised and democratised the traditional method of music-making in several ways. One manufacturer finds most significant that this revolution has transformed previously unjust working practices between musicians and technology specialists:

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[251] Photo available at http://www.ikmultimedia.com/products/hendrix/ (April 2012).

> The most important thing: We have demystified the process of music production. Twenty years ago or even ten years ago, there was not only a financial barrier, but also a knowledge gap. If you went to a studio, you saw this huge mind of staff [audio engineers] standing there, and you had no clue how it worked, and you are paying 100 bucks an hour or sometimes a lot more than that for all the stuff you do not have any idea about. So you have to pay some guy to do the work for you. Now, we demystified that process because we give people the music technology. We give people all these abilities and they can just take it home, put on a set of headphones and learn for themselves, learn how to be a studio engineer, learn how each technology works, learn how to make a record. That knowledge gap really does not exist anymore, not in the same way. We are very proud that we give that power into the hands of the musicians, instead of being in the hands of a record company or studio owner.

Along with the "demystification" and availability of digital technology, everywhere is the wide-reaching dissemination of user-generated knowledge on the Internet on how to use these software instruments. Several interviewees highlighted that many users of music technology share their technical and musical knowledge online to inform other users—incidentally closing the "knowledge gap." I emphasise these user-generated Web 2.0 practices here because, in a historical and philosophical sense, they mean a return to the artistic concept of imitation. Before the development of written notation around the 12th century, the only way to acquire musical knowledge and education from others had been to imitate and memorise their practices, as Figure 44 below illustrates.[252] Imitation is fundamental to human nature and was observed in the arts by Aristotle in ancient Greece. Aristotle's famous work *Poetics* (335 B.C.E.) states that the "instinct of imitation is implanted in man from childhood … through imitation [man] learns his earliest lessons; and no less universal is the pleasure felt in things imitated" (7). Aristotle's concept of imitation is relevant here for it directly relates to distant musical information-sharing online. Individuals who are willing to learn at a distance can easily find pleasure in imitating countless user-generated musical lessons as seen with YouTube video tutorials teaching how to play the harp, or how to create electronic drumbeats online. Aristotle would say the Internet is the new “medium of imitation” (5) enabling people to advance their musical knowledge, discover different types of instruments and learn and produce music at a distance.

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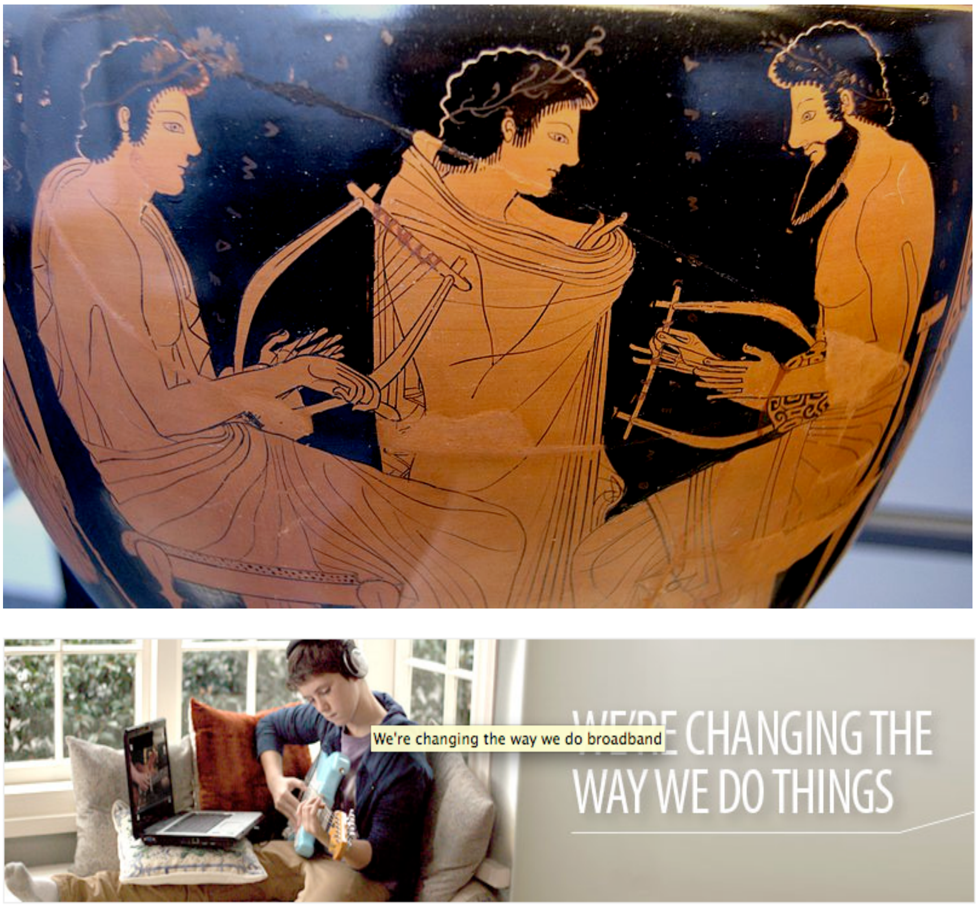
[252] Musicologist Johannes Rademacher offers a succinct overview on the entire history of music (1995) *Musik*, Dumont Buchverlag, Köln.


We're changing the way we do broadband
WE'RE CHANGING THE WAY WE DO THINGS

[Fig. 44] Above: Ancient music lesson around 510 B.C.E.—teacher right, student left; below: modern music lesson at a distance, 2011).[253]

On a related note to use and dissemination of virtual instruments on the Internet, another interviewee stated his involvement with a unique digital technology that helps children to communicate and be musically creative. The technology functions based on light beam controllers that trigger the notes of a Musical Instrument Digital Interface, in short, MIDI notes. In this way, the children can “play virtual musical instruments on beams of light. It was originally designed for dance performances.

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[253] The vase painter’s name is Phintias. Photo by Verein zur Förderung der Glyptothek und der Staatlichen Antikensammlungen, Munich, available at http://upload.wikimedia.org/wikipedia/commons/9/9b/Music_lesson_Staatlich_Antikensammlungen_2421.jpg (April 2012). Screenshot of Telecom NZ Internet advertisement, available at http://www.myspace.com/lechatelectrique (April 2012)

But, what we found is that it is great for kids who are physically disabled or autistic kids, kids who cannot pick up a guitar, or because of whatever mental abilities they have, they cannot relate. The light beam controllers work through motion. Every kid, no matter physically or mentally disabled, understands if you break this beam of light, music plays. That has been an incredibly worthwhile and valuable thing because when you see an autistic kid who has got real difficulty relating with the world, discovering for the first time how to actually create something—that is a very fulfilling experience. It makes you understand just how vital music is, and how we relate to the world, and to the children. It is a very wonderful thing."

This case is significant for it shows (in opposition to Théberge's claim above) the progressive, constructive and positive impacts of technology consumption in music-making, despite the fact that manufacturers have power and produce more and more virtual interfaces. It shows, with respect to chapter 3 on sonic heteronomy and sonic autonomy, how technology consumption can ensonify non-musicians and especially those individuals who are physically unable to play traditional musical instruments. It also shows how music technology and medical knowledge transfer and benefit from one other. Jonathan Sterne (2003) illustrated a similar situation of ensoniment historically for the medical device of the stethoscope, heralding the headphone set and our modern forms of music consumption.

However, the virtualisation of the musical world also involves some downsides. Earlier I have criticised Jody Berland's (2008) assumptions on "postmusic" (because it neglects the "pre;" that is, the human creation of the technology that she reckons as something after-human). If one were to use Berland's postmusic logic at this point, one could see a danger in virtual musical technologies as they perhaps challenge the singular position of a human musician and her fallibility, as opposed to the fallibility of a virtual machine. Yet, what the music technological laymen fail to realise is that musicians who use supposedly fully "automated" machines to produce—what philosopher Stan Godlovitch (1989) calls "ready-made" music—usually spend long hours prior to their actual performance to learn and laboriously train themselves how to use, set, and instruct the musical machine or instrument they use. Innovative DJs, music producers, or instrumentalists like drummer Zach Danziger in the band Mister Barrington or drummer Oli Rubow on his album *Organic Electro Beats* (2003) may all use some automated music technologies. But they have programmed them before any sounds come out of them. Critics might say that such sounds are less carefully programmed, but more simply dropped, as if by laymen, into the templates and grids of virtual musical instruments—resulting in some type of standardised matrix music.[254]

Another problem of the virtualisation of the musical involves the reproduction of matrix music with a live band on stage. Drummers especially, as timekeepers holding an entire band together, may practice some form of an alignment to the machine. Using sometimes hardly visible earplugs called in-ear monitors, ever more drummers today play live on stage with the click track from a virtual metronome of a laptop. Doing so allows the whole band to incorporate and play in sync with their live performance, other pre-recorded and arranged sound material on the laptop. In that sense, live musical performance has become a technologised experience for musicians and a challenge. The challenge may be seen in that music consumers become more and more accustomed to a super-accurate matrix music—leaving only minimal, close to zero, spaces of sonic deviations for musicians. The problem is that consumers may expect to hear an exact reproduction of this overproduced studio music, or matrix music, when they see a live performance on stage. That is why consumers might be surprised to hear even famous bands sound fairly different when trying to reproduce on stage what they heavily “pro tooled” earlier in the studio.

To “pro tool” a recording has become a frequently heard expression in contemporary music production. It means to have the advantage (or disadvantage) of later in-depth editing in terms of digital error correction, endless tweaking and polishing of the sounds musicians once used to carve permanently on a medium. Editing tools for music go as far as the melody, the tone pitches and the timing of percussive sounds can be transformed without loss and the need of the performer in the studio. For instance, one specific technology “fixes what’s wrong, but doesn’t mess with anything that’s right,” hints Stevie Wonder’s producer Rob Arbittier at the creative potential of this technology for the musical practitioner.[255] “It gave a lot of musicians more freedom in working with audio than before,” claims an interviewee.

Yet also, an opposing trend to the dominant “pro tooling culture” has emerged. It features the use of old analogue recording technology. Big names like the Foo Fighters began to record analogue. For example, drummer Taylor Hawkins of the Foo Fighters used the expression to “pro tool” in a critical or even negative sense. In the band’s documentary film *Back and Forth* (2011), he stated that the Foo Fighters decided to record their latest album *Wasting Light* (2011) in the traditional way on analogue tape, as opposed to digital on hard disk with Pro Tools. Recording music on analogue tape is perhaps somewhat like writing a book in pencil and paper; one cannot easily tweak and polish the score anymore. Editing on analogue tape is of course possible—though it depends on what needs to be corrected to make, say, a beat sound round and danceable—however, it is more difficult (one has to actually cut and paste the tape) and costly (the tape) as compared to virtual machines.

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[254] On a related note, Michael Young (2007) portrays an ideal autonomous performance machine in his paper “Au(or)a: Exploring Attributes of a Live Algorithm,” Electroacoustic Music Studies Conference 07, De Montfort University, Leicester, United Kingdom. Also, Robert Rowe’s (2001) *Machine Musicianship*, Massachusetts Institute of Technology.

[255] Celemony Software, “Rob Arbittier: The noisy neighbor,” available at http://www.celemony.com/cms/index.php?id=artists_arbittier&L=0 (April 2012).

In addition to well-known bands, a countercultural trend began emerging from less-famous bands, boasting that they achieved their sound with analogue instead of digital technology. “Freunde der Analogen Revolution” or “Friends of the Analogue revolution,” heralds the back cover of German psychedelic rock band Spaceship Landing’s same-named debut album of 2005, rereleased in 2012. They and other new krautrock bands like Rotor and The Blackbox Massacre did not record in their bedrooms, but in avant-garde sound studios like Die Tonmeisterei, specialising in the rough trade of analogue sound.[256] In the subtextual message of this analogue trend there resonates nostalgia about certain past times when musicians seemed to be able to record on tape a whole song in one take—no need for any major cut-and-paste jobs as with Pro Tools today. On a critical note, some protagonists of this trend seem to distinguish their approach to musical creativity more through their analogue technologies of sound than through new musical ideas. Massive stacks of analogue hardware—as opposed to software available to anyone with a computer and Internet access—seem no burden to this countercultural movement.

In conclusion, there is a twofold tension at play: On one hand, the virtualisation of the musical means a development toward ensoniment particularly because of the ubiquitous availability and accessibility of the production tools to the masses. It is the necessary materiality to perform, record, edit, develop and commercially diffuse music in high quality audio. Musicians have gained power and knowledge. Virtual production tools give them the resources towards obtaining sonic autonomy, for example, by lowering the entry barriers into the professional world of music making to the essential: passion, creativity and talent. On the other hand, the commercialisation and massification of the production tools for musicians show a decline toward sonic heteronomy. In Théberge's (1997) abovementioned understanding of modern consumption, ever more musicians draw on, rely on and trust these virtual machines, ultimately resulting in a normalisation of music and musical practices. It is a music cultural normalisation coming with the use of the already standardised materiality—the grids and matrixes of the production tools.[257] That is what Jacques Attali in "Noise" (1985) means by the "commodification" of music-making and consumption. It is a shock of traditions and institutions in music from acoustic to electroacoustic and digital modes, heralded since the advent of early telephone music. On an abstract note, the present virtualisation of the musical world represents the twofold tension between sonic autonomy as a more resourceful and independent approach to sound through digital technology, and sonic heteronomy as displacement and lack of free thought.

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[256] Sound studio Die Tonmeisterei, available at http://www.die-tonmeisterei.de/ (April 2012).

5.2. Collaborating at a Distance

By now we have gained insight into how profoundly virtual musical instruments and music studios have changed the world of music-making. Practitioners do not only use traditional musical instruments and electronic means of transmission anymore like early female operators used the harmonica and the telephone network to jam at a distance. To make music at a distance today, practitioners use computers and the Internet. However, there are some significant differences involved as to the making and availability of instruments to jam at a distance. In what follows, the interviewees share their experiences and opinions about music-making on the Internet relative to the development of the proper technology. They elaborate on some recent online architectures for musical collaboration, and discuss to what extent commercial manufacturers contribute to the development of these architectures. The main objective of this chapter section is to locate and map the key developers of the technology for distance music to find out who leads research and development in this arena. Problems and limitations in the development of the technology will be dealt with in the subsequent chapter section "Glitches of Distance Music."

By now, we learned that most interviewees recognised the use of digital music technology and the Internet as a type of ensoniment in two main ways. First, the Internet empowers musicians to gain access and exchange knowledge—fostering musical education and collaboration online. It "has been a tremendous advantage ... especially for musicians. It is a fantastic medium to exchange knowledge, training, new ideas, and to collaborate with other musicians, no matter where they are in the world or regardless of the circumstances." The interviewee's observation relates to the earlier-mentioned closing of an educational knowledge gap between musicians and technology specialists: "there are tons of very well-put-together [user-generated] demos to show the user, whatever level of sophistication they have, or whatever their interests are, how to hands-on do something. I mean, you can open up a computer software program and stare at a manual, and struggle with some of this stuff. But when you can sit and actually see somebody doing it step-by-step it is like "Aha! That is how you do it." On the Internet, the "ability for average musicians to learn and share and grow and promote themselves as artists is better than it has ever been in any time in history." That is the actual ensonifying element, the meaning and benefit of two-way communication media for distant collaborators. It is their "potential for knowledge exchange," an interviewee emphasises:

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[257] For example, on sample-based live music performance, see Randolph Jordan's (2007) "Case Study: Film Sound, Acoustic Ecology and Performance in Electroacoustic Music" (121-44), in ed. Jamie Sexton, *Music, Sound and Multimedia: From the Live to the Virtual*, Edinburgh University Press, Edinburgh.

> When I first started and wanted to become a record producer and make records, I tried to find out how everything works. It was a nightmare. Now you can talk to each other—as peers. It is not like a musician-to-fan kind of thing; it is musician-to-musician as equals. It is a knowledge sharing and sharing of ideas and a meeting of minds across the net.

Second, use of Internet as a form of ensoniment for musicians also concerns the developers of music technology. Even if the Internet represents a potential threat to the developers because of file sharing and software piracy issues, it can empower them, too. Consider that when musicians share information in some online forum about a particular musical practice, they usually mention product names of the tools they use—activities with powerful marketing effects for the manufacturers. Networking musicians perform indirect marketing work (both negative and positive) for manufacturers when discussing particular music technologies among their peers online. That is why manufacturers generally support online communication among their users, and try to strategically cultivate technology-related online communities.[258]

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[258] Jörg Beckmann and Fokko Schulz (2008) provide an economic perspective on "Online Music Communities und Kooperationsstrategien bei Steinberg Media Technologies GmbH/Yamaha Corp. Japan" (135-54), in *Community*

However, hardly any of the well-established makers of virtual music studios and instruments develop their own interactive systems to make music at a distance. I am referring to real-time musical practices on two-way communication networks as introduced by the early female telephone operators in the late 19th century. What modern manufacturers focus on is the development of asynchronous collaboration systems.

Illustrations of asynchronous collaboration systems on the Internet are manifold. For example, one manufacturer from San Francisco Bay Area cited their development of a professional asynchronous hardware system based on File Transfer Protocol (FTP) and a "bank-level or military-level encrypted server" to send files back and forth. A client of the manufacturer, the singer-songwriter Beck, would work with his studio musicians using the system. Even though they live in the same town, the interviewee said, "they are just saving the time in traffic." An interviewee from Southern California recalled his experiences with a musical network service in Los Angeles, turning orchestra scores into music: "They record the [score] for you remotely in Prague. You can watch the whole session. You even have control over the mix, and you can talk to the conductor ... in Prague all at the same time." A software developer from Sweden recognised the potential of asynchronous forms of distance music as follows: "We saw that many people like to make short songs, upload them to the Web, and have other people download them. This was before MP3 files were around. Internet connections were slow, and these song files were small. So, it was easy to collaborate on tracks using online forums and song archives on the Web. But, we do not really have anything for collaborating in real-time over the Internet."

Two additional cases are noteworthy as they describe the involvement of professional musicians in setting-up their own asynchronous collaboration systems. The first is a music producer from Italy who founded a company in California that provides musical "talent from Los Angeles to the rest of the world." He expresses if a potential client would ask for the drummer Vinnie Colaiuta living in Los Angeles: "We call Vinnie, and negotiate a deal with a studio. Then we tell the client how we will work, and produce the drum track online. This example is valid for any kind of instrument. As a result, we deliver the track back to the client over an FTP site." In

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Marketing: Wie Unternehmen in sozialen Netzwerken Werte schaffen, eds. Helge Kaul and Cary Steinmann, Schäffer-Poeschel Verlag, Stuttgart, Germany.

terms of distant interaction, this service is less sophisticated as compared to other musical services on the Internet. This is because most of the companies' clients (depending on their reputation) cannot communicate directly with the hired studio musicians (as prominent as Colaiuta) to protect the sphere of privacy.

The second case of setting-up an asynchronous collaboration system involves an interviewed music producer from England, who was according to him "one of the main guys behind Rocket Network" in Germany. Rocket Networks was a former service from the San Francisco Bay Area, a company that tried to commercialise music-making over the Internet in the late 1990s. During that time, Rocket network had a strategic partnership with a renowned manufacturer of music technology from Hamburg, Germany. As the interviewee summarises, "we worked with Rocket Network during the first big Internet boom ... and then it kind of went very sour. So we split off with Rocket Network. But some of the people [in Hamburg] were still very interested in the concept [and founded] Digital Musician." Digital Musician offers online music collaboration with real-time video conferencing and a strong community-building aspect of the medium. Yet also with this system the actual musical performance is based on an asynchronous experience of online recording.

Apart from the development of asynchronous systems, only a minority of the contemporary manufacturers are involved in developing true real-time distant musical interaction methods. Instead, focus of most developers lies on the development of related and complementary technologies: "We do not have that level of integration in our software." But "we make products that help you to interact online." A manufacturer from Berlin envisioned about systems for real-time interaction that they are "certainly going to be a feature that we hope to see really soon in the future ... There are lots of requests for that." Similarly, another interviewee noted about real-time that there are "lots of opportunities using the Internet and our [technology] already has the Internet part of it. It is just a natural transition for us to go in that direction in the future." Thus, the question becomes: if none of the manufacturers themselves, then, who leads in the design and development of actual real-time interactive technologies for music making at a distance? To answer that question further below I will suggest some main groups of developers of the technology involving mostly engineers and musicians from the non-commercial domain. They play a key role in the shaping of the means for the distributed musicsphere of tomorrow.

Despite some of the technological problems of real-time distance music (detailed in the next chapter section), it is interesting and telling to observe an early-stage differentiation in the development of the technological infrastructure for the new medium of distance music. In contrast to the thought that some of the well-established manufacturers of virtual music studios and instruments also engage in the development of interactive technologies to perform at a distance, the interviews have proven different. Though most interviewees highlighted the importance of interactive technologies for the exchange of knowledge, when it comes down to actual live musical interaction online, most interviewees remained reserved. Although live music and musical production is their technological metier, few of the interviewed manufacturers engage directly in the development of such instruments. Musical telepresence remains a highly specialised area of technology development.

Live sound transmission among distributed performers using virtual musical instruments and the Internet is a sophisticated field of expertise. This means that leading manufacturers of virtual music studios and instruments are not necessarily leading in the development of such transmission systems. Instead, new players and inventors have emerged on the scene, as one interviewee says, players in the "position of leadership:" people in the vanguard, trendsetters, risk-takers, innovators—like the makers of the Compagnie du Théâtrophone in Paris. It marketed musical telepresence in the 1890s, though the market innovation today concerns distributed performers instead of mostly distributed audiences as in the 1890s. As one interviewee said that the technology for distant live music-making will most likely become a "big deal" for musicians of the future—similar to how in the past radio and television became a big deal for music consumers. Current activities in this field of expertise of musical telepresence, I propose, come from the following three main groups of developers whose functions and relationships partly overlap: (1) academia, (2) start-up companies, and notably (3) the users themselves.

The first main group of technology developers in sophisticated musical telepresence applications is academia. This means primarily computer engineers and musicians developing together in elite research institutions what Álvaro Barbosa (2006: 57) earlier called distant or "remote music performance systems." Two central players in this academic group of developers are Chris Chafe with his earlier-mentioned SoundWIRE group at CCRMA, researching the "use of Internet networks as an extension to computer music performance."[259] Another group is formed around Alexander Carôt, formerly at the Institute of Telematics in Lübeck.[260] Whereas SoundWIRE in the United States invented the remote music performance system called JackTrip, Carôt in Europe invented a similar system called Soundjack. Both facilitate high-quality, uncompressed live audio in many ways across the Internet, serving, as detailed earlier, whole teleconcerts for distributed ensembles.[261] JackTrip and Soundjack operate in modes technologically ahead of anything comparable to the consumer market. Other academic research institutions associated with the development of musical telepresent systems are the Paris Institute for Research and Coordination Acoustic/Music (IRCAM), the Sonic Arts Research Centre in Belfast, Northern Ireland, and a group of researchers with engineer Lars Wolff at the Institute of Operating Systems and Computer Networks, Technical University of Braunschweig, Germany. A goal of academia is to manage latency issues in remote musical performance across wide geographical distances.

A second main group of technology developers in distance music are ambitious Internet start-up companies. They follow primarily commercial aims by attracting certain types of online users with what at first appearance sounds like remote musical performance systems. But they then turn out to be more asynchronous Web 2.0 remote musical composition systems with Facebook-like social media concepts of networking, collaborating, and community-building as main business. Today such businesses exist online: OnlineJamSessions, RiffWorks, eSession, eJamming, Digital Musician, and others. Digital Musician is noteworthy for its historical relationship between two of the interviewees from Germany and the United States. The Germany manufacturer briefly experimented with one of the first online musical collaboration start-up services (Rocket Network) in the late 1990s. The German company's DAW directly connected to Rocket Network for musicians to exchange files online. However, with the burst of the dotcom bubble around the turn of the 21th century, Rocket Network ceased operations. The U.S. company bought it, closed it down, and transformed Rocket Network's technology into a hardware-based, asynchronous audio file transfer system for professional music production. Also the German company retained Rocket Network's original idea of online music with creating the peer-to-peer system Digital Musician, launched independently as a start-up company in Berlin, Germany in 2005.[262] Therefore, the music technology market has changed from a situation where a leading manufacturer engaged directly in musical telepresence, to a situation where it has outsourced these experiments from its core business to a new start-up venture.

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[259] SoundWIRE's statement is available at https://ccrma.stanford.edu/groups/soundwire/software/ (April 2012).

[260] Meanwhile Carôt works in media informatics at the Hochschule Anhalt, Germany.

[261] See Alain Renaud and Pedro Rebelo's (2006) paper "Network Performance: Strategies and Applications," New Interfaces for Musical Expression (NIME) conference, hosted by IRCAM in Paris, June 2006.

While the well-established manufacturers of music technology maintain a reluctant stance towards the bellwether trend of musical telepresence, academia directly transfers knowledge into this emerging market. What demonstrates this knowledge transfer well is the start-up company MusicianLink from San Jose, California. Similar to the hardware DigiDelivery for music composition online, MusicianLink sells the hardware JamLink for musical performance online. The point is that one of MusicianLink's co-founders and chief technology advisers is Chris Chafe, who is also the director of Stanford University's CCRMA. One of the start-up's software developers is Chafe's doctoral student Juan-Pablo Cáceres. Here is an excellent case where academia feeds knowledge into the technology industry, and thereby fosters economic developments of a new sound medium and the development of a new or rediscovered sound culture.

A last main group of active developers in musical telepresence that one might overlook comes from the cultural practitioners themselves. The product Ninjam, manufactured by San Francisco-based Cockos, Inc. is an example. Cockos is an innovative software company known for its DAW called REAPER; founder Justin Frankel also invented the well-known audio tools Winamp, SHOUTcast, and the file-sharing network Gnutella.[263] Cockos' development of Ninjam is noteworthy because they licensed it as open source software under the General Public License, a free software permit that allows users to "modify and redistribute the software, which would otherwise be prohibited by copyright law."[264] Ninjam users have access to the source code of the software. They can modify the Ninjam client or establish local Ninjam servers so that the Ninjam community can benefit from these modifications. So, here individual users have influence on a technology; they can shape their own distributed performance environment. To make an intellectual achievement like Ninjam freely available to the public means to breathe the air of what Patrick Burkart (2010) calls "cyberliberties," instead of merely selling the idea of it in a copyright-protected product. Cockos with its product Ninjam, and in academia Chris Chafe's SoundWIRE research group, "decided to move JackTrip to Google Code," thus making their intellectual ideas freely available to the public.[265] To share their academic knowledge in this way is remarkable, considering that Chafe also runs the start-up company MusicianLink.

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[262] Digital Musician relocated from Berlin to Hamburg.

[263] Cockos' software is available at http://www.cockos.com (April 2012).

[264] More on the General Public License (GPL) at http://en.Wikipedia.Org/wiki/Free_software_ license (April 2012).

Contrary to what one may assume, we have seen that primary research and development in distance music comes not from the well-established companies of music technology, but from academia and social media start-up companies. In addition, a noticeable involvement in the shaping of the technologies for distance music also comes from some of the knowledgeable Web 2.0 users and telemusicians themselves instead of the well-established manufacturers of music technology. However, technological developments in participatory Web 2.0 musical applications and asynchronous collaboration differ from those in cutting-edge musical telepresence that enable live concerts among geographically separated performers.

Even though the majority of the heavy-hitter manufacturers do not necessarily focus on developing their own interactive musical systems, this does not mean they are indifferent towards the topic of distance music. Some of them revealed to have somewhat informal ties with small innovative firms, according to one interviewee, "in the position of leadership, who are making online collaboration a practical reality." Instead of trying to compete with those experimental and avant-garde firms and technology developments in the cultivation phase of the medium for distance music, the established manufacturers prefer to silently test and observe this new market within strategic partnerships. So, indirectly through their interest and support, some of the well-established manufacturers also contribute to the development of the technology for distance music. More reasons and problems why real-time musical interaction (for example as practiced by the earlier-mentioned SoundWIRE group) remain mostly an unaddressed subject matter, will be explained below.

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[265] SoundWIRE's explanation on https://ccrma.stanford.edu/groups/soundwire/.

5.3. Glitches of Distance Music

> I can do everything myself. I can literally make the record alone—I could. But I love to work with other people because I love what happens when their ideas mesh with mine, when their feelings mesh with mine, creating something that is bigger than the sum of its parts. That is really what group music making is about to me.
>
> (Interviewee, professional musician)

Most interviewees understand distance music as an upcoming trend or a "rising tide." However, when it came down to actually performing music on the Internet using recent collaborative environments like Digital Musician or eJamming, most interviewees seemed reserved. Why? In what follows, the interviewees will articulate some of the glitches or problems of music making on the Internet, and they will give reasons why the existing online music collaboration services have not yet found wide agreement among industry professionals. I will further discuss these subjects and point towards certain digital inequalities in musical telepresence today. Keep in mind the real-time aspect in musical performance as opposed to common asynchronous multitrack recording, where collaborating musicians send sound files back and forth over the Internet. The real-time or telepresent aspect of music making on the Internet is so vital because it comes closest to the traditional forms of live musical performance where musicians may perform and experiment together in the same physical space and at the same time. Whereas some interviewees remain secretive about their current developments in real-time or musical telepresent technologies, other interviewees envision how the real-time aspect could enhance their technology development in the future.

Whereas online music production—the sequential recording and adding of musical ideas to a composition—is a common Web 2.0 practice, the greatest difficulty online remains live musical performance. Although there are various services that allow users to experiment with almost-live music (e.g. eJamming and Digital Musician), several professional musicians expressed their reservations: "It is not yet that real-time feeling on the Internet." Another interviewee addressed a missing "organic thing" or feel when trying to play online, a feel that usually involves a multisensory and immediate interplay between people. Latin-American music demonstrates this multisensory interplay well. For example, in the music documentary film *Cuba Feliz* (2000), one can see various live musical performances throughout Cuba in its most vital form as human communication between the performers and the audience. Cuban music is an energetic rhythmic and melodic conversation of musical questions and answers, or a heated argument, "provoking" and "defending" one's point of view in a musical context. Spontaneous visual and sensory cues—gestures, facial expressions, smiling, laughing, closing one's eyes, giving signs, acknowledging, ignoring—accompany these musical interactions. However, on the Internet all these human "natural visual or sensory cues such as breathing and gesture," music telematics engineer Alain B. Renaud (2007: 1) says, "are completely removed from context." Even the support of video presence among telemusicians would provide little, according to Golo Föllmer (2008), to compensate for the inorganic, disembodied spirit—the aura online. One interviewee explains it this way:

> Whether in rock and roll, or jazz, or we are doing some electronic stuff. It is those inspirational kind of moments and the serendipity that happens when we are in the same room, working on the same groove. When you are over there, and I am over here, and I am talking thousands of miles, there is a latency between our communication that is not what I call—the groove.

A technological origin for the missing groove and organic feel when performing online is what most interviewees named appropriately as "latency."[266] Latency is the time-delay between, say, a flautist's action and the occurrence of a bassist's reaction. Time-delay is a natural phenomenon; it occurs in an acoustic and an electronic setting. For example in a symphony orchestra, as music technology columnist Mike Kobrin (2007) says in "Jamming at the Speed of Light," there is a "roughly 1 millisecond-per-foot delay between, say, a flautist and a bassist, who can be seated up to 50 feet apart." Kobrin continues, "humans typically notice delays of 15 to 60 milliseconds," which is one reason why an "orchestra needs a conductor to keep players in sync." In contrast, in the online world of network musical performance, telematics professor and Jazz bassist Alexander Carôt (2007) suggested a rule of thumb for latency acceptance thresholds: up to 1,000 kilometres in network distance, delay-time should remain usually under 25 milliseconds as a critical point—a threshold that corresponds with musicians in the natural world playing about eight metres apart. Above this critical point of delay-time in net music, precise musical interactions become imprecise, and especially noticeable between tightly synchronised rhythm instruments like drums and bass.

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[266] Chris Chafe and Michael Gurevich et al. "Effect of Time Delay on Ensemble Accuracy," Proceedings of the International Symposium on Musical Acoustics (ISMA), March 31 - April 3, 2004, Nara, Japan. On latency incorporating strategies, see Chris Chafe "Living with Net Lag," (2011) Proceedings of Audio Engineering Society (AES) 43rd International Conference, September 29 - October 1, Pohang, Korea.

However, one needs to realise in the latency measurement further above that 1,000 kilometres on a map do not equal 1,000 kilometres in net length. Carôt (2006) explains that in computer networks straight-line paths are rare. The audio data must traverse central routers and switches, increasing overall distance so that 400 kilometres on a map between performers can easily result in a network journey of over 2,000 kilometres for the audio data. In addition to this unperceived distance, problems lie in the network infrastructures. During a network music presentation in 2006 between Carôt on bass at the Institute of Telematics in Lübeck, northern Germany, and performers in Copenhagen, all audio data had to travel from Lübeck to southern Germany, then detour to Sweden, from where it eventually travelled back down to its destination in Copenhagen. In 2012, Carôt re-emphasises that "final latency depends on the physical distance, network capacities, the actual network conditions, and the actual routing between the involved peers." Usually, "real musical interaction is limited to physical distances below 1,000 km." Yet, it is also "important to understand," Carôt adds, "that latency acceptance thresholds vary from player to player and furthermore decrease with an increased performance tempo."[267] It became apparent from the interviews that few musicians have a latency acceptance threshold at all. As one interviewee insists: "There is nothing like you are over in L.A. and I am over in Boston, and we are trying to collaborate and in our play is a latency of 20 milliseconds or something, which is kind of disconcerting."

Reasons why acoustic latency or delay-times can turn out high even with short geographical distances, lie not only in the physical nature of bend network infrastructures and the psychological nature of the players, but also in the musical genre itself. With musical styles such as rhythmic Latin music or rock, latency is very noticeable; with ambient music (for example, meditation music), it is less noticeable.

Kobrin's "Jamming at the Speed of Light," (to recall the *Wired* article in favour of start-up eJamming,) somewhat minimises Carôt's above-detailed latency issues. However, on closer inspection, there is some distant truth in Kobrin's title. What truth? Let us recall an astronomy lesson on the speed of light. In Norwegian author Jostein Gaarder's history of philosophy *Sophie's World* (1996), the chapter "The Big

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[267] Carôt's account on latency issues in musical telepresence is available at http://www.soundjack.eu/ (April 2012).

Bang" (501-15) reminds us how astronomers measure distances in the universe in light-minutes and light-years. Whereas the rays of the sun need about eight minutes to travel through space to the earth, Pluto is already about five light-hours from us. Thus, "when an astronomer looks at Pluto through his telescope, he is in fact looking five hours back in time" because "the picture of Pluto takes five hours to get here." One can apply this idea of light speed and its visual delay time to music-making and acoustic delay time on computer networks. When we hear a sound on the network, we listen to the past just as the astronomer looks into the past. If the acoustic delay time is 25 milliseconds in acoustic speed, then we hear a sound that occurred elsewhere exactly 25 milliseconds ago. While we hear one sound, a distant performer has already started playing another sound that we won't hear until after 25 milliseconds. Hence, in the universe of network acoustics, one could say that the higher the delay-time the longer the time-travel into the past.

Again, though some of the Web 2.0 users may develop their own performance technologies, the crux is that only an exceedingly small group of privileged users can play at all effectively in musical telepresence—that is, mainly academics. Why? Because, out of the above identified groups of technology developers in chapter section "Collaborating at a Distance," only academic institutions have access to cutting-edge computer networks such as Internet2 in the United States. Largely unknown outside computer science, Internet2 "is a dynamic, innovative, and cost-effective hybrid optical and packet network designed to deliver to the research and education community next-generation production services as well as a developmental platform for new networking ideas."[268] The SoundWIRE research group does not play music on Internet2 with zero latency. But compared to regular consumer broadband, Internet2 reduces latency problems. In this manner, groups in academia can sound today like the distributed ensemble of tomorrow. This is what media theorist Roger Fidler (1997: 27) means with his principle of mediamorphosis "delayed adoption." For a new media technology like Internet2, it "requires at least one human generation (20-30 years) to progress from proof of concept to widespread adoption." Similar to Internet2 is GÉANT in Europe. Alexander Carôt used GÉANT to play in musical telepresence between the earlier-mentioned Institute of Telematics in Lübeck and a university in Copenhagen.[269]

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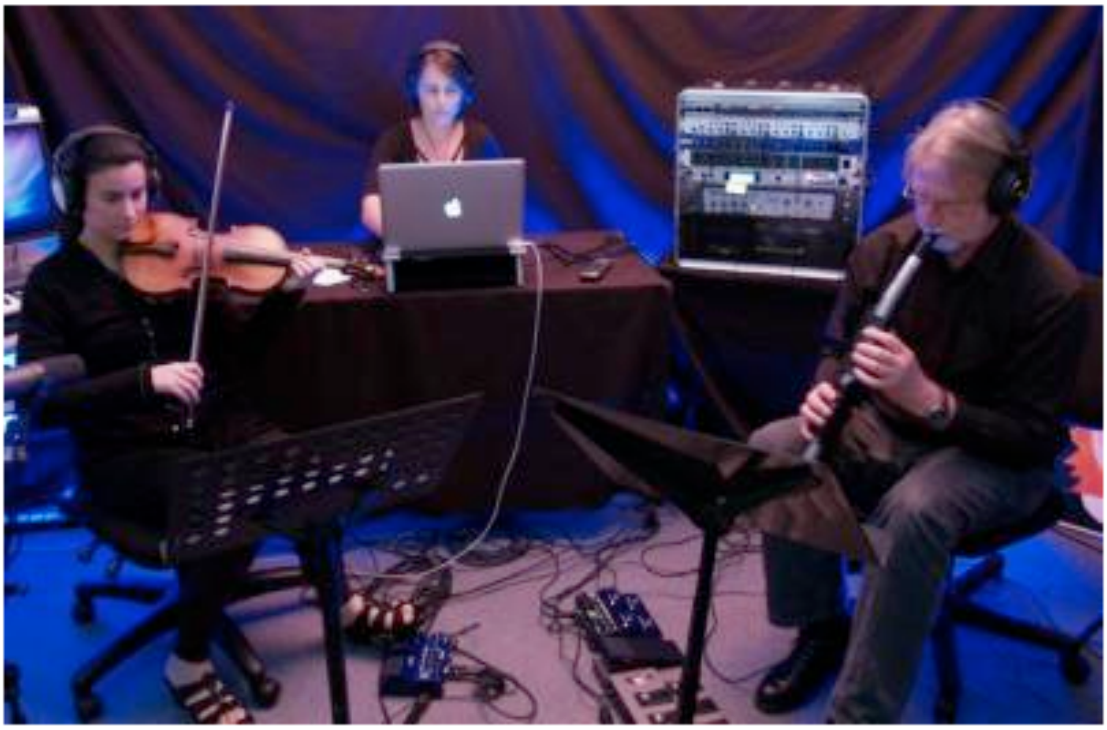
[268] Internet2 project details available at http://www.internet2.edu/network/ (April 2012).

[269] Further details on the pan-European data network GÉANT are available at http://www.geant.net/ (April 2012).



[Fig. 45] Musical telepresence among New Zealand, Canada and China, 2010.[270]

Many countries have their own sophisticated next-generation networks like Australia's AARNet or New Zealand's Kiwi Advanced Research Education Network (KAREN).[271] KAREN is significantly faster than the official New Zealand Telecom and Orcon Internet broadband. For instance, during the Beijing MusicAcoustic 2010 festival "musicians in New Zealand, Canada, and China gave a real-time, collaborative performance to a live audience in Beijing."[272] Players at the University of Waikato in Hamilton, New Zealand, used KAREN; Figure 45 above shows researcher and composer Ian Whalley on flute, Lara Hall on violin, and Hannah Gilmour on laptop. In Canada David Larson beat the Buffalo Drum while Bruce Gremo played the Shakuhachi flute in Beijing. Even the technologically advanced high-speed networks like KAREN involve both acoustic and visual latency. As Whalley notes, "New composition techniques were required in the work to accommodate the visual latency of the digital video, and provide structures that also allow for spontaneous input from performers, as the work is improvised interactively and live."[273]

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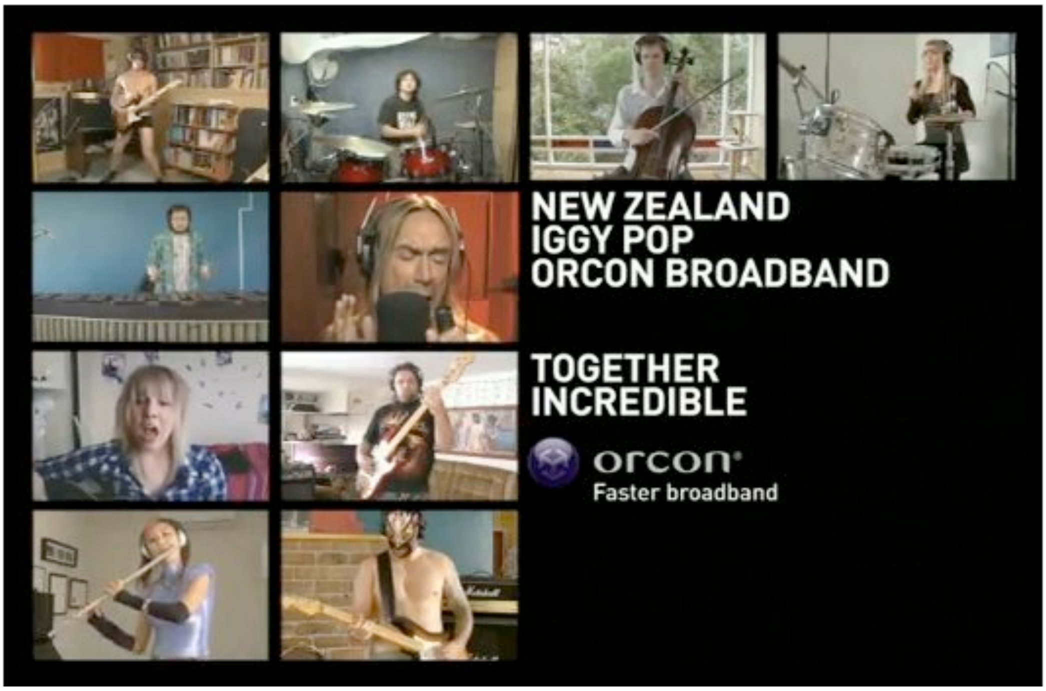
[270] Photo available at http://avcc.karen.net.nz/news/live-music-performance-ipv6ed-across-karen (April 2012).

[271] AARNet means Australia's Academic and Research Network, available at http://www.aarnet.edu.au/. New Zealand's KAREN available at http://www.karen.net.nz/ (April 2012).

[272] KAREN news by Vicki Lindsay (2010) "Live music performance Ipv6ed across KAREN," available at http://avcc.karen.net.nz/news/live-music-performance-ipv6ed-across-karen (April 2012).

However, distributed live musical performance of the sophisticated kind Ian Whalley just pointed out is currently possible only on next-generation, high-speed networks like KAREN, which excludes the vast majority of musicians, who are restricted to regular consumer Internet. One of the biggest hindrances of distance music is Internet speeds. The "transfer technology must get faster," said most interviewees. Surprisingly, Telecom and Orcon are those telephone and Internet service providers in New Zealand whose advertising campaigns suggest differently to consumers. In Figures 44 further above and 46 below, it looks as though one could team up and play live music comfortably at a distance. For instance, a creative Orcon broadband sales campaign involved 200 musician auditions, out of which nine were chosen to perform Iggy Pop's 1977 song "The Passenger" over the Internet. Orcon used, as featured in the sales campaign, a Facebook application for uploading and downloading the musicians' auditions, and Skype to audio visually link the nine finalists from New Zealand to Iggy Pop's studio in Miami. (Iggy Pop appears in the second row right picture in Figure 46 below.)



[Fig. 46] Re-recording of Iggy Pop's song "The Passenger," 2009.[274]

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[273] Ib.

[274] Orcon sales campaign "Together Incredible: New Zealand, Iggy Pop & Orcon Broadband," available at http://www.youtube.com/watch?v=CtL51VME4Qo. Further information on the campaign provides Directory—New

A few significant details about the technical implementation of the Orcon New Zealand recording session remain unclear to the consumer. To find out more, I interviewed drummer Stephanie Engelbrecht (shown at the top right in Figure 46, above) by email in 2012. I asked her if all New Zealand musicians *performed* live over the Internet with Iggy Pop in the United States, that is, all together simultaneously, or if they did a 'proper' recording—first drums and bass, then guitars and finally Iggy's vocals. She answered, "I am not sure how much I am allowed to tell you … I had to sign some kind of contract about this. I do not think I am allowed to discuss some of those details, sorry. But aside from that … we all recorded in private homes, they brought the gear and a team of people to us to set it up and ran it properly. I do not know what program they used for audio. I think it was just Orcon Broadband." After this hugely popular Internet marketing campaign Orcon's sales increased by 30 percent.

Ironically, what some of the interviewees articulated about distance music is a problem of promotion. Distance music and the technology need to have a "word of mouth as well as famous musicians who use that technology, promoting it that way." Distance music needs "a record in the charts. For example, if some well-known singer, say, Kelly Clarkson decides to take advantage of online music collaboration and makes a song in this manner. If the song is, objectively, a good product, and the product sells, then automatically online music collaboration will break the threshold." A third interviewee concluded: "I think, it is the same with most Internet trends. You need a critical mass of people who want to use a particular service. But, before all that, people need to know about the benefits of it. I think most of the musicians cannot imagine the benefits of online music collaboration right now. Maybe they had bad experiences in the past when Internet bandwidth was much too slow. Now that we have more bandwidth, online music collaboration is a thing that needs to grow. ... It is a gradually growing trend." Orcon, the Internet provider from New Zealand, realised this trend and successfully tackled the problem of promotion, although only to boost their sales as opposed to promoting the proper broadband connections to perform at a distance.

Ideas in Direct Marketing, "Orcon & Iggy Pop," issue 16, September 13, 2010, available at http://www.directnewideas.com/ (April 2012).

Instead of promoting insufficient technologies for distance music, manufacturers and Internet providers should tackle the problem of actual user-request. A professional musician correctly suggested about distance music: "I think, one of the problems is that it is technology driven—rather than investigating the question what these people really want online." To further elaborate this thought, the interviewee drew an analogy to the world of computer games. Games such as World of Warcraft have several million players whereas online music collaboration platforms such as Digital Musician or eJamming, he compares, have barely 100,000 users. It is unclear why online gaming "can be so attention grabbing" and "make you feel part of it," however, with online music-making "there is something missing; ... musicians do not automatically jump on board." A possible reason for the missing consumer acceptance of distance music might be that "there is no sense of a virtual environment ... I can talk to you, yes, I can play with you, but I do not feel like I am in the room with you." The interviewees' analogy between an online multi-player game and music situation is instructive because it illustrates the problem of presence in distance music. It is also instructive because it points to possible future research that could explore online game theory relative to behavioural psychological studies and the subject of distance music (as partly proposed in chapter 3 section on "The Inevitable Impulse: Human Motivation"). Such future research could attempt to answer the question of what draws users into the shared experience of collaborating online and what keeps them there continuing their musical practices.

Despite any social media Web 2.0 musical collaboration on commercial telephone networks, we have heard that one of the biggest issues of distant live musical performance is the technology—Internet bandwidth. Föllmer (2006) calls it the "problematic of machine" (286). "Once that is taken care of," an interviewee envisions, "and the software works really efficiently, then [distance music is] going to be a great thing—learning [and jamming] music across the world. I mean there are people […] who do not have access to well-trained musicians." We have also learned that the other significant issue of distance music is the missing social and human part on electronic networks or the "problematic of presence" (Föllmer 2006: 285). In the theory of sound reproduction, R. Murray Schafer would call it a problem of schizophonia, although in this case it would mean detached performers instead of a detached audience. Certainly, the problem of this missing human presence in music is an old problem in sound reproduction and transmission, which Clément Ader's telephone audience experienced in the 1880s. Then it was a loss of face-to-face contact mainly between musicians and their audience and the jamming telephone operators. Today on the Internet, this old problem of presence has started to develop among ordinary musicians themselves.

Discussion: Towards a Distributed Musicsphere

In view of the origins of distance music in early telephony, today the meaning of distance music reaches beyond what early observer George R. Sims noted in 1902 about London's Electrophones: they "annihilate distance" over "mammoth aerial and subterranean wire-webs."[275] While the overcoming of geographical space is still essential today, we also need to point to the importance of distance music, especially education-wise, as one interviewee hinted at the subject of ensoniment, to ensure the dissemination and progression of sound-based human knowledge. This point becomes clear when we take into account the circumstances of remote island nations. For instance, in the Pacific Ocean, the University of the South Pacific, based in Fiji, facilitates courses in distance education to the neighbouring nations of the Cook Islands, Kiribati, Marshall Islands, Nauru, Niue, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, and Vanuatu. In the Cook Islands, to take a case in point, "currently around 350 … students enrol in distance courses each semester." The "main areas of study are Accounting, Management, Primary Education, Economics, Policing, and Law."[276] However, it is easy to envision future students enrolling in distance education courses of musicology and network performance art, bringing together the talent from remote islands. Therefore today, Sim's mammoth aerial and subterranean wire-webs, as the University of the South Pacific states, "help develop the next generation of university students … in an attempt to increase education standards across the nation."[277]

Despite the significance of distance education, some observers have an aversion to the idea of distance music. This applies to some of the interviewees, and especially to one participant in the 2008 Cultural Studies Crossroads Conference at the University of the West Indies, Kingston, Jamaica. In the panel session "Popular Music, Politics, Globalisation, and Technology," I presented a paper called "Music Production in Change—Online Music Collaboration as a new Production Method." In the panel's subsequent question and answer session, I suggested that distance music might be of interest for musicology at the University of the West Indies, given the institution's several distributed campuses throughout the Caribbean in Jamaica, Barbados, Trinidad, and Tobago. A heated debate followed when Kim Johnson, a participant from Trinidad and Tobago, and a drummer and historian of steel band music, stood up and vehemently opposed the idea of distance music. The lively grooves of traditional Caribbean music, Johnson insisted, are all about the atmosphere, face-to-face presence, feel, and other sensory experiences among the performers on site. What Johnson's opinion (and the way it was expressed) shows is that one main problem of distance music is the role of the participants and their disembodied performance situation; one earlier interviewee also noted the missing organic link on the Internet.

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[275] George Robert Sims (1902) "Electrophones" (84-5), in *A Dictionary of Victorian London: An A-Z of the Great Metropolis*," ed. Lee Jackson (2006), Anthem Press, London.

[276] University of the South Pacific (2012) "USP Cook Islands Centre," available at http://www.usp.ac.fj/index.php?id=3645 (April 2012).

[277] Ib.

However, when critics have their doubts about distance music lacking an organic link, they should recall the history of telephone music. Today, most people tend not to question technologically reproduced music in the same way as when people were first introduced to it in 1881 with Clément Ader's auditions telephonies in Paris. In less than a century, the human sensory perception has become accustomed to a mediatised, disembodied listening experience of music. Similarly, in musical performances of the future—considered over a period of several decades—musicians might also have become accustomed to the specifics of electronic networks. Emerging generations of musicians, growing up with new telematic production technologies and playfully learning how to use them, will perhaps not even substantially question their mediatised performance experience—just as most people today no longer question their disembodied telephone conversations. In other words, as an adaptation occurred in the human sensory perception with listening to technologically reproduced music, so will most likely—once the technological boundaries are transcended—perception change on the part of the musicians adapting to new mediatised performance environments to make the music of the future.

What exactly the future of distance music will involve remains of course unclear. Perhaps "in about 50 years," as music technology innovator Roger Linn envisions (2010), "most musicians will have abandoned guitars and keyboards for some new type of musical instrument."[278] Perhaps musicians of the future will not even have to move their hands and feet on a real or physical instrument anymore, but use instead neuronal instruments to "think music into being."[279] Yet despite any new instruments of musical expression in the distant future, some current events of distance music already suggest that music-making in the future will increasingly move towards a larger distributed musicsphere, where performers interact at a distance between globally distributed, high-speed systems and networks. An example would be the annual Deep Wireless Festival in Toronto, Canada, a festival that "celebrates the endless possibilities of wireless and other forms of transmission in the arts." The following call for telematic performers for the Deep Wireless Festival X on May 1, 2012 states:

> Performers are invited from everywhere around the world, as long as they have access to high-speed broadband Internet and do not mind performing at potentially strange hours of the day (or night). Additionally, for a collaborative telematic piece titled "Hug the world," proposals are particularly encouraged from Asia, Africa, South America, Australia and New Zealand, and as far north and south in the globe as possible.[280]

In light of such global telematic performances it is plausible to assume a larger distributed musicsphere of the future, where it has become common practice for a new generation of telemusicians to play in what engineers Alain B. Renaud and Alexander Carôt (2007) call "virtual bands." Renaud and Carôt point out that the "cultural implications" of telematic performance technologies are "potentially significant" as to the "creation" of such virtual bands in which musicians may "collaborate in real-time from various locations on actions such as composing, rehearsing, and recording" (5). Where musicians today in telematic performances appear in two-dimensional shadows, flat on a video screen, it is conceivable in the future of distance music that tomorrow's musicians in virtual bands might collaborate in free-floating, levitating, or holographic three-dimensional (3D) projections of one another. Holographic 3D musical performances are not a distant dream of science fiction anymore (see Figure 47 below). On June 17-19, 2009, three of the so-called

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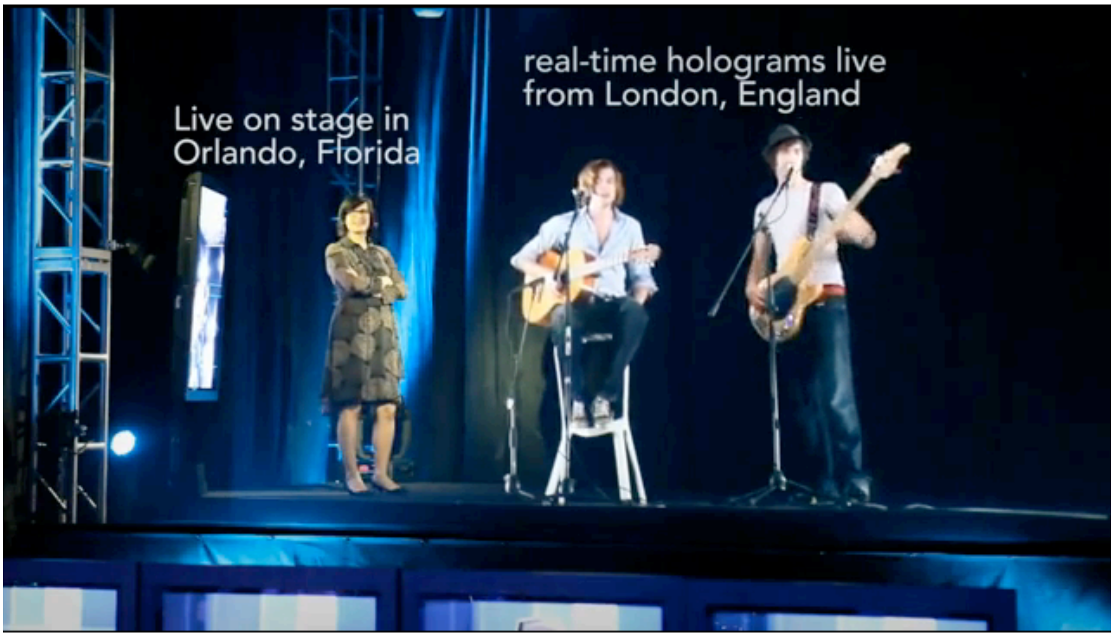
[278] *Computer Music* (2010) "Roger Linn Design," Fall iss. 157, p. 14.

[279] Ib. "Music from my ears," p. 15. This article refers to the Music on the Mind Project developing a technology that "translates brainwave data … using Electroencephalography (EEG) into notes/tones," available at www.musicofthemind.com (April 2012).

[280] Announcement by Eldad Tsabary "Come Jam with us, wherever you are: A call for performances," *Acoustic Ecology Discussion Group*, February 7, 2012. More on the Deep Wireless Festival available at http://www.naisa.ca/deepwireless/ (April 2012).

"Christie Roadster HD18K DLP projectors were used for the first-ever transmission of live, interactive 3D holograms from London and Montreal to Orlando, Florida." Albert C. Lai (2010) of ImTech, the Los Angeles-based immersive technology company in charge, further explains that "the interactive transmission process is known as Musion Live Stage telepresence and offers a new way for people to holographically communicate face-to-face in real-time, crossing the boundaries of geographic distance." After seeing the musicians interact in the video of the holographic musical performance below, one can then see the musicians walking through each others' shadows on stage.[281]



[Fig. 47] Futuristic 3D Holographic musical telepresence, 2009.[282]

In his book *Virtual Music* (2005), network artist William Duckworth envisions the music of the future, not as one of 3D virtual bands performing in state-of-the-art holographic projections mentioned above, but similarly as a future of a "live musical organism" of "collective actions" in cyberspace. Duckworth writes:

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[281] David Battino and Kelli Richards (2005) offer a chapter on "The Future of Digital Music: Dreams and Fears for Tomorrow's Technology" (241-51) in *The Art of Digital Music: 56 Visionary Artists & Insiders Reveal Their Creative Secrets*, Backbeat Books, San Francisco. See also Jonathan Sterne (2006) "On the Future of Music" (255-65) in *Cybersounds: Essays on Virtual Music Culture*, ed. Michael D. Ayers, Peter Lang, New York.

[282] Screenshot from video footage in Albert C. Lai's (2010) article "Musion Live Stage Telepresence—Holographic 3D Digital Projections," available at http://www.immersivetech.org/perception/holograms/musion-live-stage-telepresence-holographic-3d-digital-projections/#.T7D_qhwy9UN (April 2012). See furthermore Rowan Wilken's (2011) account on *Teletechnologies, Place, and Community*, Routledge, New York.

> Think of a time, for instance, when the artistic experience has the potential of being as entertaining, interactive, and engaging as the gaming experience, plus as meaningful and thought provoking as all good art. Consider the possibility that virtual music has the potential to become a live musical organism, living in cyberspace, growing and changing course because of the collective actions of its users, and we begin to get a glimpse of where we may be going, and what we may encounter along the way (166).

Yet on a critical note, what we already encounter today along the way towards a distributed musicsphere are some serious technological issues. One could say that the boundaries in the realisation of a distributed musicsphere lie in the limitations of its technological infrastructure. Though modern, high-speed broadband infrastructures exist today, it has become clear—from the above call for telematic performances for the Deep Wireless Festival X—that most musicians do not have "access" to them, only the world's technocultural elites. The rest have to use regular consumer Internet. As said before, it is due to both the human adaptation to new, mediatised performance environments, and the technology itself. The high-speed network infrastructure needs a fair amount of time to grow and diffuse into the broader musical culture. It took years for early telephone networks to transmit telephone music regularly in addition to speech transmission.

Similarly, in the history of computer networks it took decades to move from the Advanced Research Projects Agency Network or ARPANET of the 1960s (accessible then only to elites) into our contemporary Internet. Though not as long as a human generation, it might take a decade or two for today's high-speed research and education networks, among others, GÉANT, Internet2 or KAREN, to integrate efficiently with the standard consumer broadband and finally become tomorrow's Internet. In February 2012, KAREN launched a spin-off, high-speed network called REANNZ Internet. It is the "cheapest" KAREN network, which "enables subscribed members [such as public/state agencies for NZ$ 28,000 to 75,000 yearly] to access all Internet routes via their KAREN connection."[283] Tomorrow's Internet, then, means the future adoption of the world's high-speed research and education networks, like KAREN, into the already-existing consumer network infrastructure currently of lesser capability. Only then would the majority of musicians be able to perform high-quality network music—a crucial step towards the realisation of a larger distributed musicsphere.

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[283] "REANNZ Internet has been launched," available at http://karen.net.nz/reannz-internet-has-been-launched. Subscribers and membership fees at http://karen.net.nz/membership/categories-fees-and-services (April 2012).

However, developments towards the realisation of a larger distributed musicsphere involve more than just network capability. Transformations in music and technology such as the emerging trend of distance music come about in a top-down way by technology manufacturers, and in a bottom-up way by the users. Besides the most obvious practice of open source technological developments by the users themselves, one interviewee noted in this regard that the development of music technologies emerges also out of necessity from “heavy user request.” That is how, for example, one of the interviewed manufacturers’ remote collaboration technology came into being on the Internet. Internet service providers also have the technological potential to assist the future of distance music directly. They could activate and allocate specific amounts of network channel capacity or network bandwidth (as Orcon probably did for its own Iggy Pop session) with extra-high throughput speeds specifically for customers willing and able to pay additional fees. Another factor is political decisions on the expansion of a national(ised) Internet infrastructure. Ideally, people would select technological progress of a nation’s network infrastructure by their vote for this or that political party, having high on their agenda the bridging of digital inequalities. Generally, the implementation of a distributed musicsphere is about both the technology itself, and human beings controlling the development of the technology in the first place. As one interviewee put it aptly, music is about “humans and technology together.”

Whether early telephony or tomorrow’s Internet, telepresent media technologies involve a deeply fundamental momentum that tends to empower human beings in a number of ways. Most importantly, it has the power to make human beings freer because it provides them with the necessary freedom of action to communicate and exchange ideas and artistic creations directly and openly at a distance. In this way it could unite human beings across the world in the way expressed by Schiller and Beethoven (1824) in the earlier-mentioned “Ode to Freedom” or “Ode to Joy:”

> Thy magic reunites those
> Whom stern custom has parted;
> All men will become brothers
> Under thy gentle wing.

6. Conclusion and Future Work

“Distance Music—From Early Telephony to Tomorrow’s Internet” has explored technology diffusion and transformations in music culture. The project started out from the idea of a distributed musical scenario with performers being physically separated from one another—performers who are playing at a distance over electronic networks. Chapter 1 introduced and located the subject of distance music within the narrow field of technology research on network musical performance. Chapter 2 opened up the subject within a larger framework of ideas on transformation in music culture and technology. Chapter 3 discussed Jonathan Sterne’s theory of Ensoniment in relation to distance music. Chapter 4 provided an empirical case study on the history of distance music in the late 19th century, followed by an empirical interview-based case study in Chapter 5 with contemporary technology developers on the situation of distance music today and tomorrow.

As a result, this work has shown (1) that the age of distance music began decades earlier than is commonly perceived in music in media history, with early telephony; (2) and that with early telephony, there had already been a way for people to independently create, circulate and consume music at a distance before 1900 and without the intervention of external content providers. (3) Yet, today, over a century later, distance music still involves major technological inequalities or a digital divide. As William Gibson suggests in his science fiction novel *Neuromancer* (1984), the future is already there, it is just unevenly distributed. In distance music, there is not yet a large-scale development and massive diffusion of the medium into musical everyday life similar to the development of early telephone music in the late 19th century.

Future sound and technology studies scholars can benefit from this thesis, particularly regarding the work on early telephone music. As a starting point for further analysis, future studies could trace the unique regional, national and international strands in the medium’s cultural and technological development. For example, in New Zealand, it is often heard that the first music transmission happened at Otago University in 1921. But about 40 years earlier in 1878, there had already been a successfull performance of a dual telephone concert at a distance of several kilometres between the Telegraphic Offices in Christchurch and Akaroa.[284] Early telephony represents a forgotten origin in music and media research, a lost heritage of present-day music through the media that foreshadowed or heralded our modern uptake of music today and tomorrow. I believe the subject of early telephone music bears great potential for future research. In particular, use of archival material from different European and international countries could greatly assist in salvaging hidden research treasures in the historical development of the first music transmission medium.

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[284] "A Telephone Concert," (1878), Lyttelton Times, in *North Otago Times*, Volume 1823, Iss. XXVI, p. 2.

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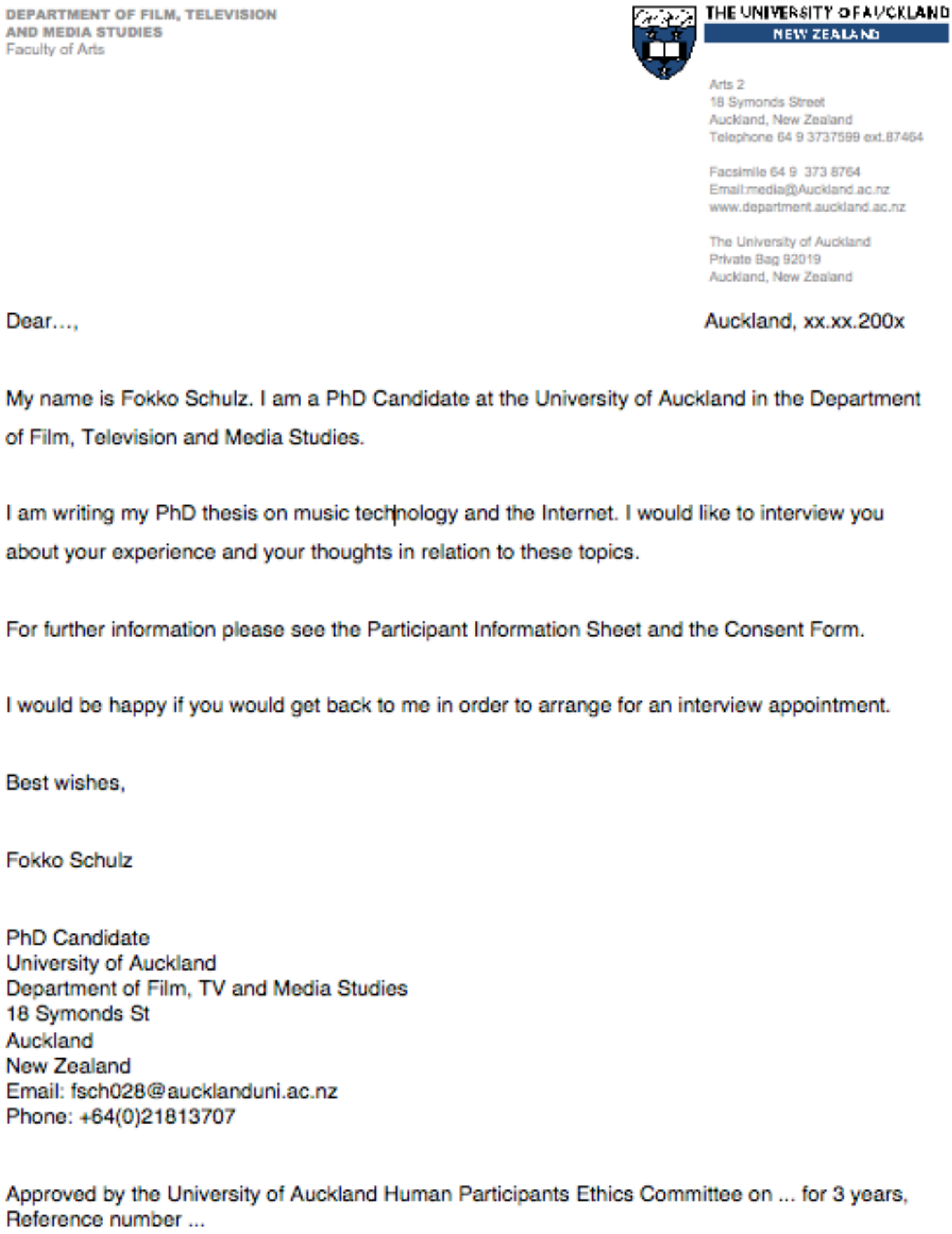
Appendixes

A1: Ethics

"Distance Music—From Early Telephony to Tomorrow's Internet" involves human data collection. This is indicated in the Ethics documentation including the Introduction Letter, Consent Form and Participant Information Sheet. The researcher's interview study with manufacturers of music technology and musicians has no harmful effects on the research subjects. It is a risk-free interview situation for all participants. All identifying data have been anonymised, and the Ethics documentation informs participants about the purpose, duration and procedures of the interviews. The Ethics documentation approves the confidentiality, privacy and protection of the recorded audio data identifying the research subjects. The Consent Form clearly states that participation in this project is voluntary. Musicians and technology developers can withdraw from the interviews. The consent form provides the researcher's full contact details for potential questions about the project.



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Auckland, xx.xx.200x

Dear…,

My name is Fokko Schulz. I am a PhD Candidate at the University of Auckland in the Department of Film, Television and Media Studies.

I am writing my PhD thesis on music technology and the Internet. I would like to interview you about your experience and your thoughts in relation to these topics.

For further information please see the Participant Information Sheet and the Consent Form.

I would be happy if you would get back to me in order to arrange for an interview appointment.

Best wishes,

Fokko Schulz

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Approved by the University of Auckland Human Participants Ethics Committee on ... for 3 years, Reference number ...

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Auckland, New Zealand

Auckland,

XX.XX.200X

Consent Form: This consent form will be stored for a period of six years.

Project Title: "Distance Music—From Early Telephony to Tomorrow's Internet"

About me: Fokko Schulz, PhD Candidate, Department of Film, Television and Media Studies, University of Auckland

Declaration of Consent:
I hereby agree to take part in this research. I have read the Participant Information Sheet and fully understand its content. I have had the opportunity to ask questions regarding the proposed interview.

I understand that

- Participation in this interview is voluntary.
- I may withdraw at any time during the interview and/or from the research project within two weeks after the interview.
- I will only have to provide information that I volunteer.
- I am encouraged to stop the interview should I feel any personal discomfort.
- This Consent Form will be securely stored at the premises of the University of Auckland for six years.
- Audiotapes, files and transcripts of the interview will be securely stored at the premises of the University of Auckland for three years or until the research project has finished.
- Audiotapes, files and transcripts will be destroyed after three years. I will be asked for written consent once the research project has finished. If my consent is not given, then all data will be destroyed.
- The interview is available to me, should I request it.
- It is unlikely but possible that I could be personally identified in the final publication, even if my name is not published.

I agree / do not agree (please circle one) that the interview will be recorded by electronic means. I understand that I may ask to have the recorder stopped at any time.

I agree / do not agree (please circle one) that my full name may be published in the final thesis.

Signed: ....

Name: ....

Date: ....

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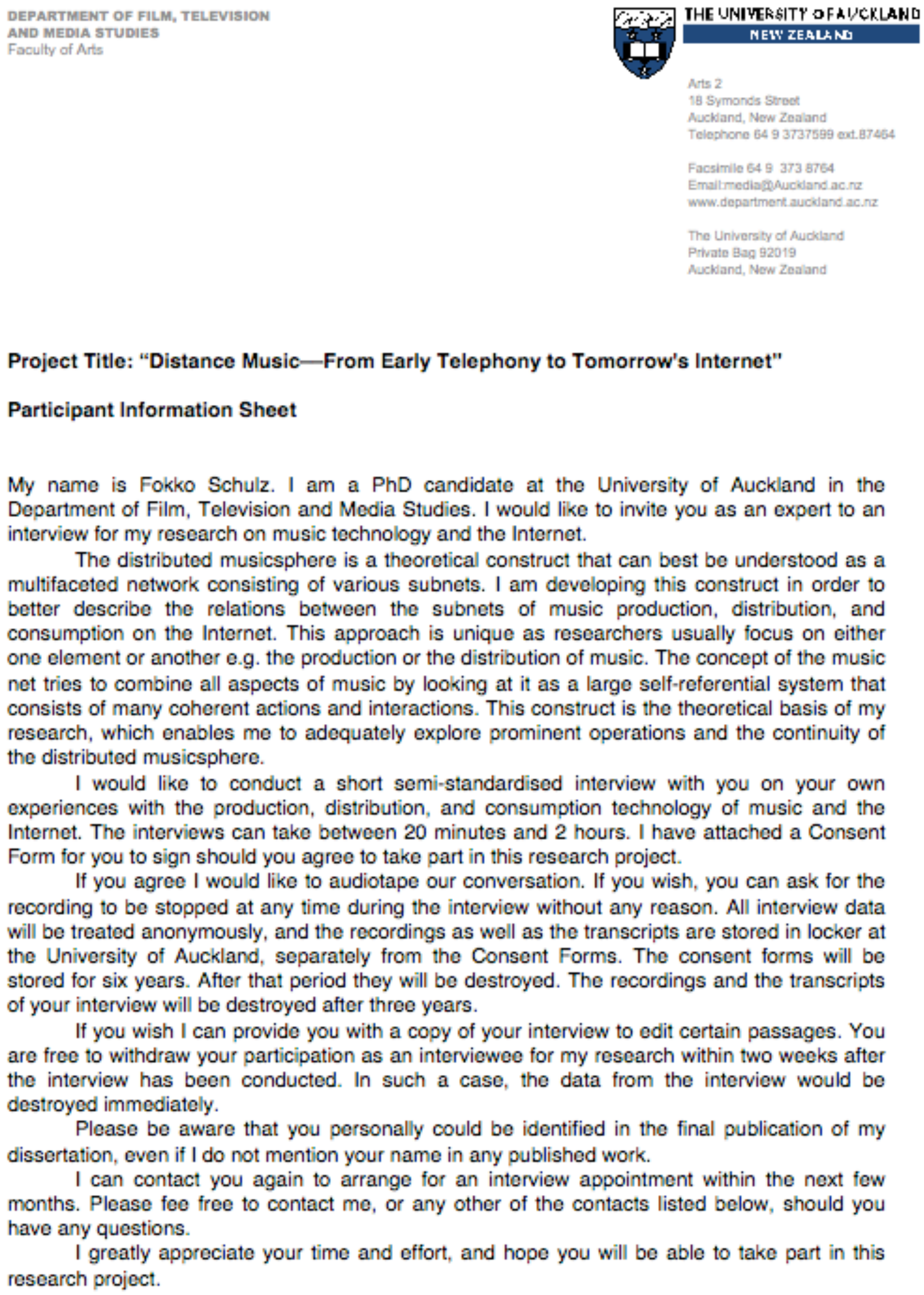

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Auckland, New Zealand

Project Title: "Distance Music—From Early Telephony to Tomorrow's Internet"

Participant Information Sheet

My name is Fokko Schulz. I am a PhD candidate at the University of Auckland in the Department of Film, Television and Media Studies. I would like to invite you as an expert to an interview for my research on music technology and the Internet.

The distributed musicsphere is a theoretical construct that can best be understood as a multifaceted network consisting of various subnets. I am developing this construct in order to better describe the relations between the subnets of music production, distribution, and consumption on the Internet. This approach is unique as researchers usually focus on either one element or another e.g. the production or the distribution of music. The concept of the music net tries to combine all aspects of music by looking at it as a large self-referential system that consists of many coherent actions and interactions. This construct is the theoretical basis of my research, which enables me to adequately explore prominent operations and the continuity of the distributed musicsphere.

I would like to conduct a short semi-standardised interview with you on your own experiences with the production, distribution, and consumption technology of music and the Internet. The interviews can take between 20 minutes and 2 hours. I have attached a Consent Form for you to sign should you agree to take part in this research project.

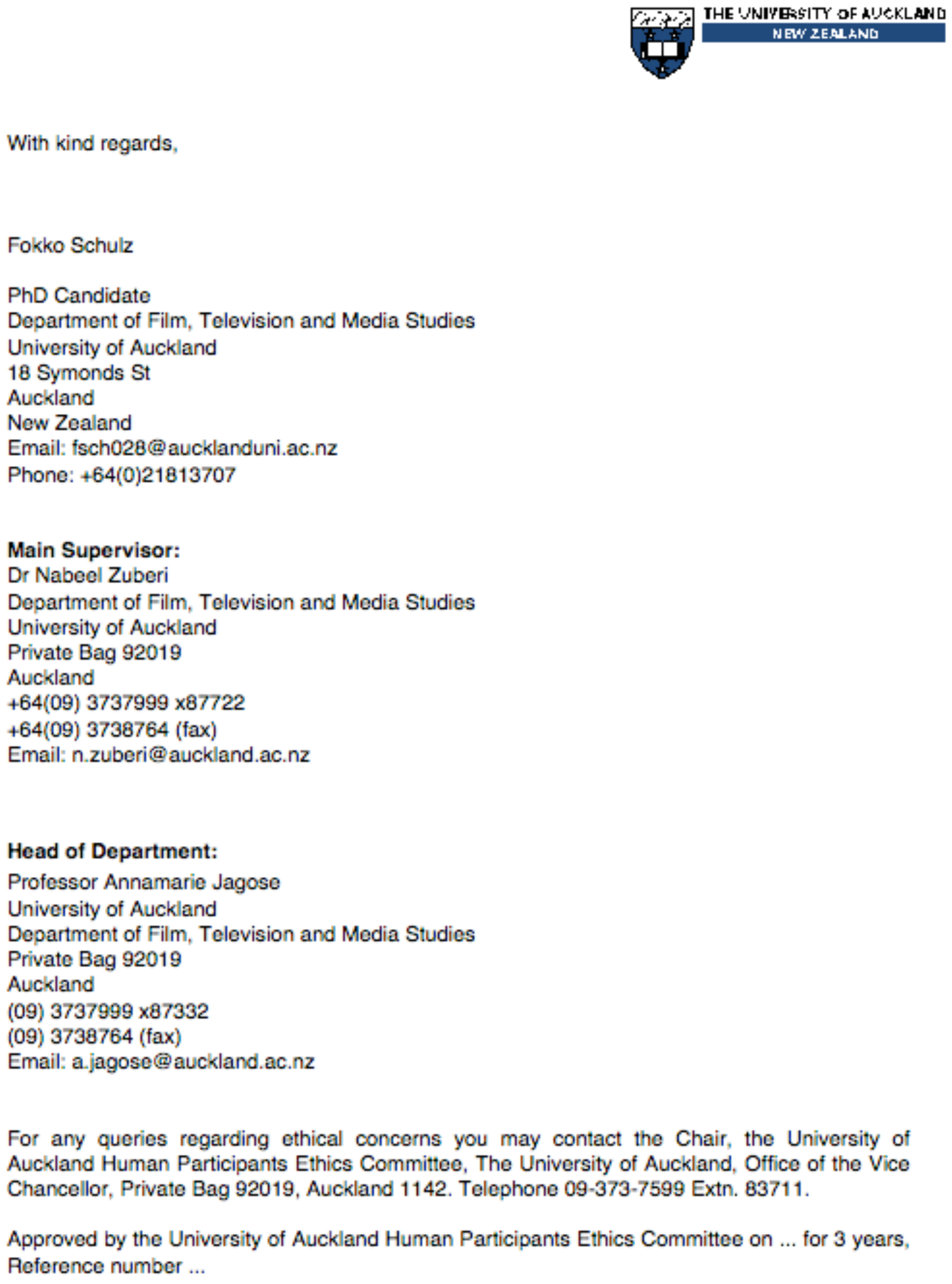
If you agree I would like to audiotape our conversation. If you wish, you can ask for the recording to be stopped at any time during the interview without any reason. All interview data will be treated anonymously, and the recordings as well as the transcripts are stored in locker at the University of Auckland, separately from the Consent Forms. The consent forms will be stored for six years. After that period they will be destroyed. The recordings and the transcripts of your interview will be destroyed after three years.

If you wish I can provide you with a copy of your interview to edit certain passages. You are free to withdraw your participation as an interviewee for my research within two weeks after the interview has been conducted. In such a case, the data from the interview would be destroyed immediately.

Please be aware that you personally could be identified in the final publication of my dissertation, even if I do not mention your name in any published work.

I can contact you again to arrange for an interview appointment within the next few months. Please fee free to contact me, or any other of the contacts listed below, should you have any questions.

I greatly appreciate your time and effort, and hope you will be able to take part in this research project.



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With kind regards,

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For any queries regarding ethical concerns you may contact the Chair, the University of Auckland Human Participants Ethics Committee, The University of Auckland, Office of the Vice Chancellor, Private Bag 92019, Auckland 1142. Telephone 09-373-7599 Extn. 83711.

Approved by the University of Auckland Human Participants Ethics Committee on ... for 3 years, Reference number ...

Interview Questions

Main interview questions for manufactures of music technology:

- What impact do digital music technologies and electronic networks have on music making in general?

- How does your company deal with the subject of online music making?
- What do you think online music making needs to really take off?

Main interview questions for professional musicians:
- In what way do digital music technologies and electronic networks influence you as a professional musician?
- In what way do you use the Internet for your work as a professional musician?
- What do you as a professional musician think online music-making needs to really take off?

A2: Interview Materials

Virtualisation of the Musical

[redacted] of [redacted]: What do you want first, me or the company?

You

[redacted]: Ok, I'll give you the company first. [laughs] [redacted] has been around for about 20 years, and [redacted] pioneered music software. [redacted] created the first-ever MIDI sequencer system. Now, we created [redacted], well, what became [redacted], eventually. We've been making [redacted]for a very long time. Then, 12 years ago, we did what we call [redacted]VST—Virtual Studio Technology. What we did was we took all of the studio, the hardware, what people see when they watch old videos, when there's a guy standing in the music studio with big mixing desks, and big tape machines and all that rubbish, we put it all on the computer. I've got a studio. I'm a record producer. I work in the studio but my entire studio is inside my laptop now, everything. And that's what's so wonderful about what [redacted] does. So, instead of—how it used to be—if you were a musician and you wanted to make a record, you got to go to your record company and beg them to give you a hundred thousand dollars so you can go into a studio for a week. Now, you just take one thousand dollars, buy yourself a laptop and a copy of [redacted], and you can do it in your bedroom.

Just a couple of hours ago, I was talking to Teddy Riley, a pioneer of New Jack Swing. He's a legend in dance music in this country and he uses [redacted] all the time. He's doing a new record with Snoop Dogg. He's doing the new Snoop Dogg album on [redacted]. And he was playing back some of the songs from the Snoop Dogg record, and he opens up a song and he was like, "Yeah, I wrote this one in my bedroom." And I was like, "Wow." He says, "Yeah, we just put Snoop's vocal over it." And I am like "Okay," and then Riley opens up the next song and goes, "this is another one I did in my bedroom." So, even albums as big as Snoop Dogg—and it doesn't get much bigger than that—are actually being made on [redacted] in a guy's bedroom. It's incredible, and I love it because when we first started at [redacted], we were very idealistic. It wasn't just about, you know, let's make some money on software; we actually wanted to democratise the music-making process. We wanted to be able to let any kid with a guitar and an idea to be able to make a record. And because everybody starting to work at [redacted]was a musician, we wanted it for ourselves. We couldn't afford to go to studios. We totally lowered the board, so that the only board entry is talent, really. If you've got a good song, you can just get a copy of [redacted]and you're done. It's a wonderful thing. It's something I'm very proud of.

The most important thing: We've demystified the process of music production. Twenty years ago or even ten years ago, there was not only a financial barrier, but also a knowledge gap. If you went to a studio, you saw this huge mind of staff standing there, and you had no clue how it worked, and you're paying 100 bucks an hour or sometimes a lot more than that for all the stuff you don't have any idea about. So you have to pay some guy to do the work for you. Now, we demystified that process because we give people the music technology. We give people all these abilities and they can just take it home, put on a set of headphones and learn for themselves, learn how to be a studio engineer, learn how each technology works, learn how to make a record. That knowledge gap really doesn't exist anymore, not in the same way. We're very proud that we give that power into the hands of the musicians, instead of being in the hands of a record company or studio owner.

[redacted]of [redacted]: Talking about music-making generally and not just about [redacted], I have to say—in recent years with computers getting more affordable, and the software products getting more and more intuitive and easier to use—that has opened up a whole lot of possibilities for users at every level to get into the music-creation process on computers. That is what has been happening—an evolution over time and it's a really exciting time.

[redacted] of [redacted]: We definitely helped raise the bar of how music is made and the quality of what goes on stages and into studios across the world, not just the United States. We make high-end products. Mostly professional musicians are using these, although recently, we've got many consumer-based products for people that maybe never thought of getting into music before. We're giving them some channels and ways to get in there. So, we're broadening the market that way.

[redacted] of [redacted]: There's two main ways how [redacted] influences the world of music making. The first is that [redacted] is something that if you have a computer you can record professional quality audio pretty much anywhere. I mean records are being made on tour buses now; records are being made in peoples' homes. So I think democratising the recording studio and bringing it into people's homes as the end user has been the biggest influence we have on the world of production. The other way is that we use software to do many things that hardware products used to do. There are sound compressors and sound limiters and things that used to come in a big box, quite expensive. We make software that does that now. So that's another big way.

[redacted] of [redacted]: One of the big things we're seeing is that people tend to move from a hardware to a software-based world, and I'd say that [redacted] is part of that revolution in music.

[redacted], tell us about [redacted] Live; how does it affect music-making?

[redacted] of [redacted]: There are two ways to look at [redacted] Live. There is a session view, and there is an arrangement view. The session view is very popular with the flip boxes [a function to switch between the session and arrangement view in real time], and one is able to launch different clips in succession to get really creative on interacting different pieces of audio. Then, on the whole flip side is an arrangement view, which gives you the whole DAW linear approach, which you can certainly stay in the entire process of your production. So you're able to work in a complete linear mode, but you're also able to work in a session page to get creative from a DJ perspective or a remix perspective. I think a really important thing to point out is that there are plenty of DAWs on the planet, and they all give you a linear view, which is great for meticulous audio playing into a track working from left to right. [redacted] gives you that linear view too, but also gives you the session view, which allows you to launch different creative ideas at different times, all in sync and you can work those into the linear arrangement page. Those two views alone have had heavy impact on live playing, and lot of people's studio work.

[redacted]*, tell us about* [redacted] *and* [redacted]*. What's the idea behind the making of these virtual instruments?*

[redacted]: Our focus at [redacted] Multimedia has always been to make really great-sounding gear available to as many musicians as possible. Starting with [redacted], we actually began the process of tracking down and finding classic collectible gear that the average musician could never afford. Then [...] we modelled this classic gear so that we can put it together in software, and release it at a price that almost everyone could afford. That's really been the heart of our amp simulation modelling. With the [redacted] we modelled a little over $36,000 worth of famous brand-name collectible guitar and bass gear. With [redacted] Jimi Hendrix (see Figure 44 below), we did the same thing and modelled over $30,000 worth of rare, almost impossible-to-find vintage guitar effects. And then we're able to put that together in a software package and really make it available to everybody.

[redacted]*, how do virtual sample libraries and virtual instruments affect music making?*

[redacted]: Well, they made it feasible for a composer who is working on, for example, a film scoring project or a producer working on an album to, essentially, have everything that he needs—a total tool kit of sounds—right at his disposal without having to bring a single musician in the studio. Now, of course, in the long run, typically, a lot of the stuff will be recorded by a full orchestra or a live band, but for a composer to sit down and write music with all the sounds that he is just about gonna have as the end product. It makes it so much easier and so much quicker for a composer to write and flesh out a full symphonic score or a full rock band with everything right in his studio, and he can do it at 3am in the morning; he doesn't need to wait for musicians to show up. And the sounds are such high quality that you can give that demo to a producer or director of a film, and they might not even know that you didn't hire a full orchestra or a full rock band to record that. It makes the job of a composer so much easier to have all the equipment at his disposal.

[redacted]*, Stevie Wonder's producer Rob Arbittier once said, '*[redacted]*fixes what's wrong, but doesn't mess with anything that's right.'*[285] *Could you explain in more detail how* [redacted]*influences music production?*

[redacted]: I think that [redacted]influences music production in quite a wide way. [redacted]allows you to edit audio notes in the same way you can edit MIDI notes. You can take a vocal recording and change the melody to something completely different by changing the tone pitches, creating a new melody, adding the timing, even with the singer not being in the studio anymore. The same goes for percussive sounds, changing its timing, or trumpets, saxophone, and bass. That gives lots of musicians great freedom in working with audio, such as recycling existing audio recordings for remixes, or just correcting some wrong pitches in some recording, or correcting wrong timings. [redacted] is either a fixing tool, a remix tool, or a tool to be creative for whatever you have. So it's kind of a mixture of all that, and I think it gave a lot of musicians more freedom in working with audio than before.

Collaborating at a Distance

[redacted]of [redacted]Multimedia: The Internet has been a tremendous advantage I think for business all around, but especially for musicians. It's a fantastic medium to exchange knowledge, training, new ideas, and also with some of the other companies in the industry that had been doing some really amazing things with being able to collaborate with other musicians, no matter where they are in the world or regardless of the circumstances. I think just being able to get music into the public arena is much easier, and communicating with other musicians, [...] the ability for the average musicians to learn and share and grow and promote themselves as an artist is obviously better than it has ever been in any time in history.

How does [redacted] *Multimedia deal with online musical interaction?*

Well, currently we don't have an online interactive way for our users to work with each other. Obviously, we use the Internet to make our products as widely available as possible. Anyone who visits [redacted].com has the opportunity to download either a demo version of our software […] or special limited versions that we give away to musicians for free. So it's a phenomenal way for them to get access to our products to learn this, to watch celebrities or your famous musician to use our software. We also maintain a strong online presence with all of our online reviews in different publications so that the average person that wants to learn about our products or about how to use our products has the most possible resources to help them grow as an artist.

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[285] "Rob Arbittier: The noisy neighbor," available at http://www.celemony.com/cms/index.php?id=artists_arbittier&L=0 (April 2012).

In addition, we have strategic partnerships with some companies that have very bold and unique new ideas. One of the companies that we are very closely allied with is called Sonoma Wireworks that make a product called RiffWorks. We think it's a phenomenal way for musicians to interact together using their RiffWorks software and the online service called RiffLink, which basically enables people to collaborate on compositions regardless of where they are in the world. So, while we don't necessarily focus on developing our own products in that arena, we definitely support and collaborate with people who are in the position of leadership like Sonoma Wireworks, who are making online collaboration a practical reality. Instead of trying to compete with Sonoma Wireworks, we help them to grow that technology and with it the music community as a whole. The idea is that, when we support these kinds of companies, then this improves the music industry as a whole; and obviously, a rising tide lifts all boats.

[redacted] of [redacted]: [The Internet] makes everything a lot more accessible. You can be in multiple locations and send the music file to somebody else. In the film and music industry a lot of this is going on when they're making a film and they're in such a crunch. Let's say you're on iChat—you could take your music that you're working on and drag it right out of your Pro Tools session or your Logic Audio session into the iChat window, send it to your director so he can listen to it—all in a span of about five minutes. And then the director can come back and tell you, "Okay, I don't like this section, you need this softer or louder."[286] So you don't have to set up a meeting and wait a week; otherwise, you have to take so much time just to coordinate all that. But with the Internet and especially with file transfers, you can work almost instantaneously, and you can have a team of people around the globe, all working right at the same time.

How does [redacted] *deal with musical interaction online?*

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[286] Logic Audio is a DAW by Apple Computer, originally made by former German music technology company Emagic.

Well, one of the great things is that our sample libraries have become a standard; lots of composers have our libraries. That means that they can collaborate from different locations. They can pull up, say, their Logic Audio session or their Digital Performer session that has our sounds loaded into it.[287] Composers can send that to their buddy halfway across the globe and he can finish that song because he's got all the same sound samples. He can load it right up. It's a seamless work flow, and you wouldn't even tell that two different people were part of it. Another thing that we do, and that we have a lot of pride in, is that we have a big user base online. We have an extensive user forum on our website [redacted].com. It's a strong community of people who post music links in the forum and mention their critique. Many professional people are in there so you can get some good advice on any questions. We have a big tips and hints section that various users of all levels can use to find out about all sorts of information or to just ask the question and then have it be responded to by professional composers and producers.

[redacted] of [redacted]: A lot of people used to run out to the studio, and everyone had to be at the same place to get together and record music. Now people can work on a recording session in one place: You could be in a huge studio in Berlin and desire a certain guitar player. So you send him the session over the Internet. He can record the part in his own studio and send it right back to you in the speed of however long it takes to upload a gigabyte or whatever size the session is going to be.

How does [redacted] *deal with musical interaction online?*

Well, we actually have a hardware product called [redacted], using File Transfer Protocol (FTP). [redacted] is a bank-level or military-level encrypted server. Let's say you're making a motion picture, the Harry Potter movie, and you want to send a musical score to somebody, then you can upload it to the [redacted] server and kick it across the world. I mean it's about digital information so everything from a huge motion picture to a rock band where two guys are living across town, you can send files back and forth. I know that, for example, Beck personally works with a lot of his musicians sending files back and forth, and they live in the same town. They are just saving the time in traffic. It's absolutely amazing that we can do that now.

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[287] Digital Performer is a DAW by American music technology company Mark of the Unicorn (MOTU).

[redacted] of [redacted]: Well, the Internet in general allows people from all over the world to work together in relatively easy ways. Especially nowadays with fast Internet connections you can even swap uncompressed audio files. You don't have to sit in front of the computer and download them for hours. On the other hand, there's a downside of the Internet with people being able to swap files, and the big discussion comes up with music piracy. The same goes for software companies with cracked software. But I think the Internet has more positive than negative sides for the music business because it allows individuals to promote music without having a record deal or being tied to a major company or something like that. It's a tough business and it got even tougher through the Internet. Personally, I love the Internet and I use it on a daily basis. I don't think it has only negative impact on the music industry. I think it's actually a great tool to work musically, swapping files between people even on different continents.

How does [redacted] deal with musical interaction online?

[redacted], I have to say, doesn't really have any features for something like that. [redacted] is just about changing, editing, and being creative with audio files. So we don't have any special features to convert a session in [redacted], for example, to a Podcast or something like that. I think it's a really cool concept for all those online music applications or whatever they are, but we don't have any such special features. I think it's not really necessary for [redacted] because at some point the music needs to be created before you can upload it and that's what [redacted] is for. So that's not integrated, we don't have anything for online interaction in [redacted] at the moment. I am not sure if such features might be on the to-do list of our engineers at [redacted]. Right now, [redacted] users would have to work in the old fashioned way of sending files back and forth by email.

[redacted]: [redacted] was one of the first companies to take on the whole Web 2.0 thing, meaning we were one of the first to have a MySpace page with links to Google movies. On those Google movies are just tons of very well-put-together product demos to show the user, whatever level of sophistication they have, or whatever their interests are, how to hands-on do something. I mean, you can open up a computer software program and stare at a manual, and you can struggle with some of this stuff. But when you can sit and actually see somebody doing it step-by-step it's like "Aha! That's how you do it." The other important thing is that we got a Flickr site where we have pictures of artists using our tools for music production. Sometimes, users can get inspired by seeing some artist they happen to be in love with, in a top-notch studio. Just that studio environment is exciting. However, sharing music is another conversation.

How does [redacted] *deal with music sharing or musical interaction online?*

We're not like those online sites where you're in one city and I'm in another city and we got our web cams and we can be recording in real-time on each other's projects. We don't have that level of integration in our software. What we have inside our product [redacted], one of our popular products [...], is this thing called [redacted]. [redacted] allows you to manage and uploaded your final songs via FTP to your MySpace or your private commerce page, and you can also put in there and manage different cover art. That's how we are engaging with online interaction. I mean, its still kind of a mono-directional thing. It's not the interactive back and forth. However, it is a way for individuals to be empowered to get their music out there through their own resources in their own time.

[redacted] of [redacted]: Well, I think [in the Internet] lies the whole working feature and the whole beatmatching and elastic audio in [redacted] Live. You're able to take different tracks downloadable online through different companies like iTunes. And you're able to put those into the [redacted] Live browser and actually work with tempo and align those to your master conductor track and lay those into a track that you already got in there. So you take a track at a 120 BPM or bring in a break beat track at a 140 BPM, 150 BPM, lay that into [redacted] and seamlessly line those tracks up, working with our Warp markers.[288] You can work at a fast, creative pace. Just by dragging online tracks into the browser inside [redacted] Live, and have those tracks work concurrently to tempo.

How does [redacted] *deal with musical interaction online?*

Well, that's certainly going to be a feature that we hope to see really soon. Maybe in the future version of [redacted] Live. There are certainly lots of requests for that, so it would be cool to see the ability to work in one studio with your own session arrangement and have somebody in Brisbane, Australia and work interactive. It is something that hopefully lies in the future of development. It's hard to say right now.

[redacted]*, in the late 1990s,* [redacted] *joined forces with Rocket Network, which soon ended services. In what way does* [redacted] *engage in online interaction today?*

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[288] BPM is beats per minute. [redacted] Warp marker function allows performers to stretch audio data in real time.

[redacted]: We worked with Rocket Network from the Bay Area quite a long time ago, pioneering music-making over the Internet. You could actually sit down and record with some guys across the world, which was quite remarkable. Today, [redacted]—he founded the company [redacted]—actually owns a new company called Digital Musician. [...] Digital Musician is like a World of Music Craft, instead of World of War Craft, just like an online multi-player music-making facility. It was a very clever idea.

But I think what's more important than that for musicians is just the potential for knowledge exchange. When I first started and wanted to become a record producer and make records, I tried to find out how everything works. It was a nightmare. Now all you have to do is type into Google or go to websites like MI7.com, a musicians' community I work for. MI7 is like MySpace only for musicians. They cannot only share their music as they do on MySpace, but they can actually talk to each other—as peers. So, it's not like a musician-to-fan kind of things; it's musician-to-musician as equals. It's a knowledge sharing and sharing of ideas and a meeting of minds, if you like, across the net. That has been great. We got thousands and thousands of people using it all the time. It's a very positive force. We've had meet-ups of some of the people online and we do little parties and stuff like that. These people are so enthusiastic because being recognised by fans is one thing, but being recognised by your peers, by people you respect, really can mean a lot. That has been a satisfying experience.

Music can be such a vital force. I occasionally consult with a company called OptiMusic. OptiMusic make light beam controllers. There are light beams that trigger MIDI that trigger music. I use that with [redacted]. For example, I can trigger instruments; I can play virtual instruments on beams of light. It was originally designed for dancers. So you can do dance performances. But, what we found is that it's great for kids who are physically disabled or autistic kids, kids who cannot pick up a guitar, or because of whatever mental abilities they have, they cannot relate. The light beam controllers work through motion. Every kid, no matter physically or mentally disabled, understands if you break this beam of light, music plays. And that's been an incredibly worthwhile and valuable thing because when you see an autistic kid who's got real difficulty relating with the world, discovering for the first time how to actually create something—that's a very fulfilling experience. It makes you understand just how vital music is, and how we relate to the world, and to the children. It's a very wonderful thing. That's why I do what I do in this industry.

Your experience with OptiMusic shows us how music technologies could eventually serve medical knowledge. Tell us some more about your other experiences at [redacted]*. What happened after* [redacted] *involvement in Rocket Network?*

We totally separated. We worked with Rocket Network during the first big Internet boom that the people in the Bay Area know all about. And then it kind of went very sour, as people in the Bay Area also know well about. So we made a decision to split off with Rocket Network. But some of the people at [redacted] were still very interested in the concept. A couple of the guys who were at [redacted] made a spin-off of their own company to do the Digital Musician system. It runs as a plug-in inside [redacted]. It gives you video conferencing and sort of a real-time music production system all inside one window, which is really [redacted].

[redacted] *programmed Digital Musician?*

That's right, [redacted]. I have known [redacted] for a long time. [redacted] is one of the true bona fide software geniuses. I mean, the guy is incredible; very quiet, very humble man, but just comes up with the most astounding things. I've lost count of the number of times that people have said that something was impossible on the computer, and two days later, [redacted] invented it. He has literally done impossible things, several times, and completely changed the nature of music-making himself, as an individual. He invented the so-called Virtual Studio Technology (VST). He was the first guy who figured out you could actually run music in the processor or a computer. Everyone said that was impossible and that was in the 1980s.[289] It's really astounding. I have immense respect for [redacted]. I love working with him. As co-worker and human being, he's just an amazing person.

[redacted] of [redacted]: [Regarding the Internet], we make products that help you to interact online. So, we are embracing all those musicians and artists, and provide them with tools. If you record in your home studio, we have the tools to make that happen, and to get your music directly onto the web and to share music with your friends across the world. It's easy to work in an environment where you no longer need to be in a studio with the entire band. You can actually send files and build the product along those lines. We're definitely embracing that now.

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[289] The interviewee means commercial music technology. Max Mathews pioneered computer music decades earlier in the 1950s, as Peter Manning (2004) describes in *Electronic and Computer Music*, Oxford University Press, New York. See also R. Luke Dubois (2011) article "The First Computer Musician," in The New York Times Opinionator, available at http://opinionator.blogs.nytimes.com/2011/06/08/the-first-computer-musician/ (April 2012).

How does [redacted] *embrace online musical interaction more specifically?*

Well, as far as online musical interaction, I guess I misunderstood your question. We have digital recorders. Our [redacted] recorder is extremely popular for us right now. It's a handheld. We have our [redacted] recorders, which are table top recorders that allow you to record right in your home via USB or however you're getting it on your computer. Those tools allow you to do that. Many people think, "Oh, [redacted], they're the people who make synthesisers." We make synthesisers, but we also give you recording products and the sequencing and sampling […] so you can get your project up and running.

Leo [redacted]-[redacted] of [redacted]: We started out with a program called [redacted], now discontinued. We saw that many people like to make short tracks, upload them to the web, and have other people download them. This was before MP3 files were around. Internet connections were slow and these ReBirth song files were small. So, it was easy to send them back and forth and collaborate on tracks. And that has sort of continued in [redacted], where song files are small too, so you can share them with your friends easily via email. People collaborate a lot on forums, upload their tracks to different song archives on the web, and discuss the software.

We don't really have anything for collaborating in real-time over the Internet. But many people start on tracks, save them as [redacted] song files, and then send them to each other, to friends and continue working on them, and then return them. I've done that myself, and it works really well. It's a lot of fun, and you can collaborate on tracks with people in other cities and other parts of the world. However, there's nothing built into [redacted] that helps you collaborate with friends in real time.

[redacted] of [redacted]: The Internet has become a vehicle for exchanging ideas, starting from MySpace up to various different companies; there are so many out right now, for instance, eSession.com. It has become another way for musicians to meet and express themselves not having to necessarily fly over and move things around. Again, technology is giving us one more tool that allows creativity.

How does [redacted] *deal with musical interaction online?*

[redacted] does not deal with that directly. But [redacted] makes a tool for the computer to be used as a guitar amplifier, making it easier for users to take advantage of online interaction services.

How do you as a musician and producer deal with online musical interaction?

I deal with that really well. I'm from Italy, but I moved here to Los Angeles because of the enormous talent that happens in the city. I actually thought of improving the availability of talent in the world by putting together a company called [redacted].com. We cater to talent from Los Angeles to the rest of the world.

How does [redacted]*.com work?*

It's a simpler service compared to the other online music production services out there. Individual users who would like to take advantage of the musical talent in Los Angeles email us on what they are looking for. We go and find the talent in the city, make a price, and produce the song or parts of it for this client over the Internet. For example, if they want Vinnie Colaiuta on drums. Vinnie lives in Los Angeles, where he gets most of his work when he's not touring. We get the request from the client. We call Vinnie, and negotiate a deal with a studio. Then we tell the client how we will work, and eventually produce, in this case, the drum track. This example is valid for any kind of instrument. As a result, we deliver the track back to the client over an FTP site. But musicians [...] cannot interact with other musicians directly. In other words, musicians can notify us that they play a certain instrument and have a certain résumé, and that kind of stuff. Then we can include these musicians in our roster of available musicians and propose them to the rest of the world.

[redacted] of [redacted] Instruments: [With the Internet], people can work in different places. Maybe someone in Europe is doing the guitar work, and another in New York sings. Both can share files for one project. It enables people to collaborate musically, though right now, we don't have any product supporting online music collaboration. However, we have products in our portfolio that could be updated eventually for people to create sounds together using our virtual instruments, or they could collaborate on projects from remote locations using our hardware controllers. This is definitely something on our agenda for the coming years.

[redacted] of [redacted] Research: The Internet plays a major role. However, our current line of [redacted] doesn't really go online. In the future, our [redacted] will go online. Imagine you are a keyboard player, and you work for a famous musician; you're touring with him. You're at a live gig, and you need a special sample patch for the show. Imagine downloading it onto your stage just before the show and have it all dialled in. [...] Or think of people creating sound samples. For example, a person records something, creates samples, and puts them on his website. He made a really good sample collection and everybody wants to use those samples. So, I have a virtual sampler in [redacted] and I want to use the samples that this person created. Imagine tying the [redacted] to that website, where you can download that person's sample patches. Great. Not just sample patches, but also whole pieces of music could be downloaded onto the [redacted] and reproduced by a sampler. The possibilities are literally endless. [...] There're lots of opportunities using the Internet and our [redacted], which already have the Internet part of it. It's just a natural transition for us to go in that direction in the future.

Glitches of Distance Music

What does music-making on the Internet need to really take off?

[redacted] of [redacted]: To really take off, I think first the transfer technology must get faster. I mean, my experience with it so far is kind of cool, but it's still kind of like you're over there and I'm over here. You know, musical creation is about the organic thing that happens when we are working together in one space. Whether in rock and roll, or jazz, or we are doing some electronic stuff. It's those inspirational kind of moments and the serendipity that happens when we are in the same room, working on the same groove. When you're over there, and I'm over here, and I am talking thousands of miles, there is a latency between our communication that's not what I call—*the groove*, although it's getting better. Practically speaking, if you're over there, and I'm over here, and you're sending me some tracks you need me to do an overdub for, we can do it, but it's still not that same experience as if we were in the same room, working together, for sure. The more this online experience happens, the more it seems like real, even though it's not. I mean, I'm just giving you my personal experience as we are sitting here talking.

Do you think [redacted] *will enable musicians to play online in the future?*

Of course, it's a possibility in the way the technology is just cruising right along. It's a huge possibility. But we don't have anything [...] right now that addresses musical interaction online specifically. From a technological perspective, it took years for broadband to really make the penetration it does today. Not until broadband was really established with reasonable transfer rates, even websites were lively experiences—never mind trying to transfer any type of audio data or video data or both together at the same time. So now that we're getting faster and faster transfer rates, that's opening up the possibilities to make it more of a real-time interactive experience because there is nothing like you're over in L.A. and I'm over in Boston, and we're trying to collaborate and in our play is a latency of 20 milliseconds or something, which is kind of disconcerting. But that's all getting better now. Things are changing, rapidly.

[redacted] of [redacted]: Well, I think it's getting pretty close. A lot of it is Internet bandwidth. It's hard to do an eJamming session in some locations if you don't have very good bandwidth. But there are some amazing things happening. There is a service that I know in Los Angeles where you can go to and bring your full orchestra score with you. They'll record the whole thing for you remotely in Prague. You can watch the whole session. You even have control over the mix, and you can talk to the conductor. You're sitting in L.A. and they're recording your orchestra in Prague all at the same time. It's called Orchestra Net. It's a great service. It's something that I'm surprised there's not more of, but I'm sure there will be because a lot of our users are so busy with production, and the composers always want to throw people into the mix whether for a video game, a movie score, or an album. There is so little time to travel around, and so many films coming out on budget because of the accessibility of all the equipment and high-level expertise. There is not a lot of budget anymore to go and record in Hollywood and some of the places are more expensive. So now you can go online and record maybe either just your strings or your chorus or your whole orchestra in real time—you get it right then and there. I'm sure more of that will pop up. There're a lot of session drummers and horn players who will take your music from your Pro Tools session or whatever you have over the Internet. You're giving them your file, and they'll play or solo, and, then they give it back to you. Now, you got a live player on your recording. But also [redacted] Sounds has a strong online community of musicians, and lots of those guys collaborate on songs. We're trying to foster that.

[redacted] of [redacted]: Basically, the only hindrance is moving big files on the Internet. A big session could be two or three gigabyte; a film session could be ten gigabyte. For Internet speeds to pick up, everyone is looking for that solution, but in the music technology space, and as an industry we've been relying ourselves on Internet file transfer specialists to solve that problem. [redacted] is taking a step forward and many other companies too. It remains to be seen who comes up with the technology that best moves big files across the Internet fast and securely.

[redacted] of [redacted]: Even today's Internet speeds are too restricted. With those few file-swapping systems out there you still have an audio file compression issue so that it takes longer for the files to show up than directly with uncompressed audio. It's not yet that real-time feeling on the Internet like musicians would perform together in the same studio. That's something that probably distracts many people from playing online. I'm not sure what really needs to happen there, but, I think, first of all it's about another increase in Internet speed. In addition, it needs to have a word of mouth as well as famous musicians who use that technology, promoting it that way. That's probably what needs to happen.

[redacted] of [redacted]: I think what needs to happen with online music collaboration is a record in the charts, made in that way. For example, if some well-known singer, say, Kelly Clarkson decides to take advantage of online music production and makes a song in this manner. If the song is, objectively, a good product, and the product sells, then automatically online music production will break the threshold.

[redacted] of [redacted]: I think, it's the same with most Internet trends. You need a critical mass of people who want to use a certain service. However, before all that, people need to know about the benefits of it. I think most of the musicians cannot imagine the benefits of online music collaboration right now. Maybe they had bad experiences in the past when the Internet bandwidth was too slow. Now that we have more bandwidth, online music collaboration is a thing that needs to grow. Companies like Digital Musician, I assume, don't have the size yet to afford international trade fairs like the NAMM show, but maybe in the forthcoming years. It's a gradually growing trend, and if we would have this interview in two years, one wouldn't need to wonder where those companies are. I guess they will be here then.

[redacted] of [redacted]: I think it just takes heavy, heavy user request. I think it just takes a barrage of users on our forum—one of the biggest music software forums on the web. I think it takes people in there, like singers, to request, "please, please, please let us collaborate online in [redacted] session page, let us be able to launch clips from computer-to-computer." I think that user force has to build up. In the same way, we answered user requests for tempo nudging, automation lanes, the new compressor, and the new slicing audio. Those are results of heavy user request that we answered from [redacted]6 into 7. Therefore, I think it's just a matter of time, and people really pushing us to get that interactive feature out there.

[redacted]*, you said that* [redacted] *users collaborate much online. Are there any plans for a real-time musical environment in* [redacted]*?*

[redacted]-[redacted] of [redacted]: I wouldn't really doubt it. We try not to talk so much about the future. We really like to talk about our current products. We don't want to say too much about what we're planning because then people will get disappointed if we don't do it, or if we do it in a different way. So, we try to just talk about what we already have.

[redacted]*, what does online music collaboration need to take off?*

[redacted] of [redacted]: That's a very interesting question. Personally, I've been thinking about it a lot because I was one of the main guys behind Rocket Network at [redacted]. I was the liaison. It was something very important to me, and I really love what [redacted] is now doing with Digital Musician. I've also seen the eJamming stuff, and that's actually very cool technology. They got some nice stuff there. However, I think, one of the problems is that it's technology driven—rather than investigating the question what these people really want online.

I love computer games. I play a lot of online games. I run my own Guild Wars, okay. That's how I waste my life. I play online games all the time, and I love it. It's great. It's fun. It's exciting. It's very social because I'm on tour all the time, travelling all the time. My friends are all over the world. Instead of going to a local bar, I would go to my local online place and hang out. It's my way of keeping in touch with my friends. I really like it a lot, and I waste a lot of time there. Anyway, that's another story. Online gaming is obviously very attractive when World of Warcraft has seven million playing and Guild Wars about two million people playing. But there's not a million people on Digital Musician Net, not even 100,000 people. That's remarkable. I am not quite sure myself why something like World of Warcraft can be so attention grabbing. It can grab you and make you feel part of it while something like Digital Musician doesn't. I think that of all such online systems, nobody's quite figured out what that missing link is. There's something missing in there that means that musicians don't automatically jump on board, and I don't know what that is. I wish I did. I think it might be—or it is partly because there's no sense of a virtual environment. Sure, I can talk. But it's more like instant messenger than World of Warcraft. Yeah, I can talk to you, yes, I can play with you, but I don't feel like I'm in the room with you. Maybe that's it. I don't know.

I'm an online kind of guy. I'm online 24 hours a day in games or instant messengers or whatever. That's what I do. I mean, I run MI7.com, the musicians' community. But I also play live with my band, because I love playing with them. They are really great. It's a wonderful camaraderie. There's nothing that can beat that shared experience when a great band gel together. Also, I love playing live for audiences. I love it when I can stand up on a stage and have 1,000 or 4,000 people screaming and jamming up and down and having a great time. I love it when there's half a dozen cute girls in the front going, "Oh my God, you're so sexy." [Cut that bit out. Laughs.] It's great. It's a wonderful thing. I still tour a lot because I love that physical interaction. It's a wonderful and amazing thing. Also, in the studio, I love collaborating, although with [redacted] I can do everything myself. I can literally make the record alone—I could. But I love to work with other people because I love what happens when their ideas mesh with mine, when their feelings mesh with mine, creating something that's bigger than the sum of its parts. That's really what group music making is about to me. So, I do work with my band. We got two guitar players and a keyboard player. I'm in a band called The Cassandra Complex. We've been making records for a very long time.

I heard Cassandra Complex was on tour.

Yeah, we just came back from Brazil. We haven't played for about five years, actually. We just got re-formed and got back together. During last summer, we were playing festivals across Europe. We did the Wave-Gotik-Treffen in Leipzig where we headlined up for about 4,000 people. That was kind of nice. It's industrial and gothic kind of stuff like … You know the Sisters of Mercy? [*Yes.*] I used to be with their band. They're good friends of ours. Anyway, we've just done Brazil. We're doing Mexico in April. Actually, we may play in the Bay Area in April as well. We haven't played in America in five years, either. The last tour we did in the U.S. was with Front 242, and that was a fantastic tour. We did New York, Chicago, San Francisco, Los Angeles, San Diego—really a lot of fun. We did the Maritime Hall in San Francisco. It was a really good venue, terrible sound, but a great show.

Does Cassandra Complex collaborate on the Internet?

We've done that before, yeah. But we'd like to be together. We have been together in a long time. We know each other well. And so, we like that physical interaction. And all these computers, onstage, everything is computerised. Even the guitar players use laptops. They use Native Instrument's virtual GuitarRig, which is a wonderful thing. For example, when we did Brazil, instead of having Marshall cabinets around or whatever, we just jumped on the plane with the guitar in one hand, and the laptop in the other. When we got to the venue, there was a big Roland Jazz Chorus 120 Amplifier, and somebody brought that to my guitar player and asked, "Will this do?" And my guitar player replied, "Yeah, it'll make a great stand for my laptop." And this guy was like, "What?" Then my guitar player puts his laptop on top of the amp stack, plugs the guitar into the laptop and starts playing—over GuitarRig. So, that's the only reason we use guitar amps. They make great laptop stands, also visually. We actually point the laptop to the audience so they can see the laptop running the guitar simulator. It sounds great, and it feels wonderful. We love it. We use GuitarRig for the guitars. We run the drums and the backing tracks off [redacted], and the keyboard player plays virtual instruments in [redacted]. We use Native Instrument's Kontakt, we use Terratec Komplexer, which is a really great synthesiser. I love it. We use some HALion from [redacted], and stuff like that. It's a really good system. Ironically, I'm the only guy on stage without a laptop because I'm the singer. One of the reasons we do all that is because many people think that computer music means only Kraftwerk.

But it's you guys and music technology.

And that's what it should be. It's human beings and technology together.